PRICE $1.00

## Assembling and Using Your...

# Heathkit

## TUBE CHECKER

MODEL TC-2

**HEATH COMPANY**

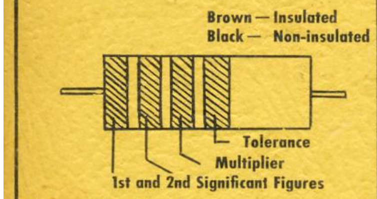
*A Subsidiary of Daystrom Inc.*

**BENTON HARBOR, MICHIGAN**

595-63

# STANDARD COLOR CODE — RESISTORS AND CAPACITORS

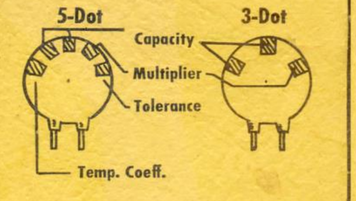
### AXIAL LEAD RESISTOR


Brown — Insulated
Black — Non-insulated
Tolerance
Multiplier
1st and 2nd Significant Figures

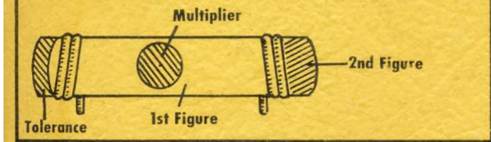
Wire wound resistors have 1st digit band double width

| INSULATED | FIRST RING | SECOND RING | THIRD RING |
|---|---|---|---|
| UNINSULATED | BODY COLOR | END COLOR | DOT COLOR |
| Color | First Figure | Second Figure | Multiplier |
| BLACK | 0 | 0 | None |
| BROWN | 1 | 1 | 0 |
| RED | 2 | 2 | 00 |
| ORANGE | 3 | 3 | ,000 |
| YELLOW | 4 | 4 | 0,000 |
| GREEN | 5 | 5 | 00,000 |
| BLUE | 6 | 6 | 000,000 |
| VIOLET | 7 | 7 | 0,000,000 |
| GRAY | 8 | 8 | 00,000,000 |
| WHITE | 9 | 9 | 000,000,000 |

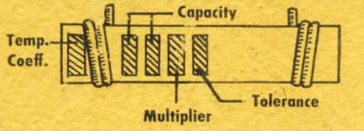
### DISC CERAMIC RMA CODE


5-Dot
3-Dot
Capacity
Multiplier
Tolerance
Temp. Coeff.

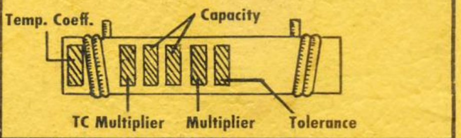
### RADIAL LEAD DOT RESISTOR


Multiplier
2nd Figure
Tolerance
1st Figure

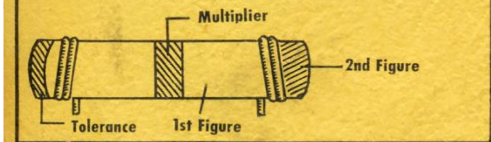
### 5-DOT RADIAL LEAD CERAMIC CAPACITOR


Capacity
Temp. Coeff.
Tolerance
Multiplier

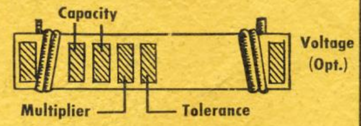
### EXTENDED RANGE TC CERAMIC HICAP


Temp. Coeff.
Capacity
TC Multiplier
Multiplier
Tolerance

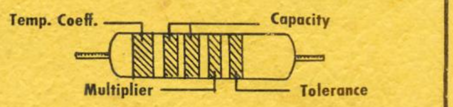
### RADIAL LEAD (BAND) RESISTOR


Multiplier
2nd Figure
Tolerance
1st Figure

### BY-PASS COUPLING CERAMIC CAPACITOR


Capacity
Voltage (Opt.)
Multiplier
Tolerance

### AXIAL LEAD CERAMIC CAPACITOR

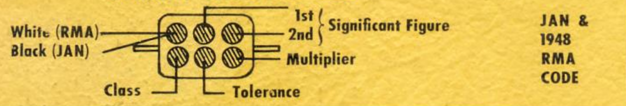

Temp. Coeff.
Capacity
Multiplier
Tolerance

The standard color code provides all necessary information required to properly identify color coded resistors and capacitors. Refer to the color code for numerical values and the zeroes or multipliers assigned to the colors used. A fourth color band on resistors determines tolerance rating as follows: Gold = 5%, silver = 10%. Absence of the fourth band indicates a 20% tolerance rating.

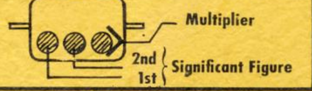
The physical size of carbon resistors is determined by their wattage rating. Carbon resistors most commonly used in Heathkits are ½ watt. Higher wattage rated resistors when specified are progressively larger in physical size. Small wire wound resistors ½ watt, 1 or 2 watt may be color coded but the first band will be double width.

## MOLDED MICA TYPE CAPACITORS

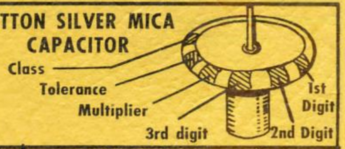
### CURRENT STANDARD CODE


White (RMA)
Black (JAN)
1st
2nd
Significant Figure
Multiplier
Class
Tolerance
JAN & 1948 RMA CODE

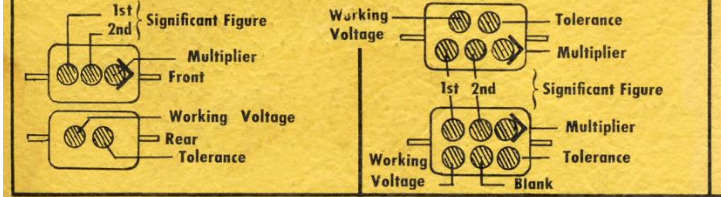
### RMA 3-DOT (OBSOLETE)
### RATED 500 W.V.D.C. ± 20% TOL.


Multiplier
2nd
1st
Significant Figure

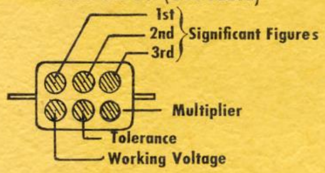
### BUTTON SILVER MICA CAPACITOR


Class
Tolerance
Multiplier
3rd digit
1st Digit
2nd Digit

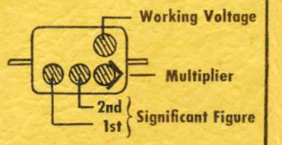
### RMA (5-DOT OBSOLETE CODE)


1st
2nd
Significant Figure
Multiplier
Front
Working Voltage
Rear
Tolerance
Working Voltage
Tolerance
Multiplier
1st 2nd
Significant Figure
Multiplier
Working Voltage
Tolerance
Blank

### RMA 6-DOT (OBSOLETE)

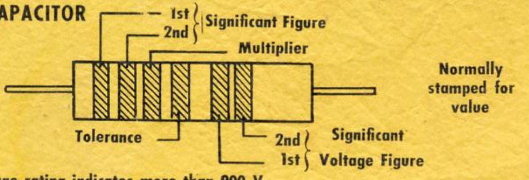

1st
2nd
3rd
Significant Figures
Multiplier
Tolerance
Working Voltage

### RMA 4-DOT (OBSOLETE)


Working Voltage
Multiplier
2nd
1st
Significant Figure

## MOLDED PAPER TYPE CAPACITORS

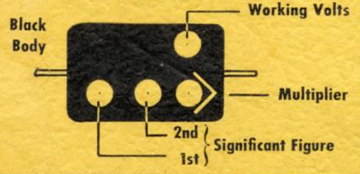
### TUBULAR CAPACITOR


1st
2nd
Significant Figure
Multiplier
Normally stamped for value
Tolerance
2nd
1st
Significant Voltage Figure

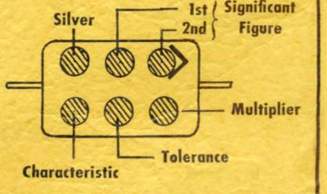
A 2 digit voltage rating indicates more than 900 V. Add 2 zeros to end of 2 digit number.

### MOLDED FLAT CAPACITOR

Commercial Code


Working Volts
Black Body
Multiplier
2nd
1st
Significant Figure

### JAN. CODE CAPACITOR

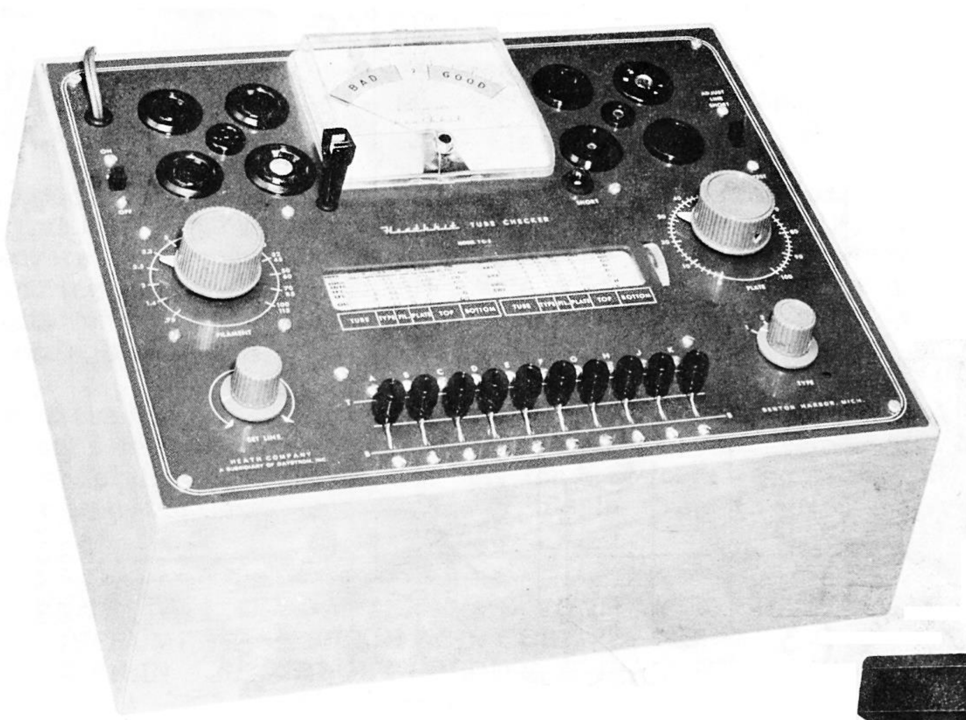

Silver
1st
2nd
Significant Figure
Multiplier
Tolerance
Characteristic

The tolerance rating of capacitors is determined by the color code. For example: red = 2%, green = 5%, etc. The voltage rating of capacitors is obtained by multiplying the color value by 100. For example: orange = 3 × 100 or 300 volts. Blue = 6 × 100 or 600 volts.

In the design of Heathkits, the temperature coefficient of ceramic or mica capacitors is not generally a critical factor and therefore Heathkit manuals avoid reference to temperature coefficient specifications.

Courtesy of Centralab

# ASSEMBLY AND OPERATION OF THE
# HEATHKIT TUBE CHECKER
## MODEL TC-2



### SPECIFICATIONS

Simplified set-up procedure.
Rapid switch selection of individual tube elements.
Any combination of base pin connections.
Check for quality, emission, shorted elements, open elements, and filament continuity.
Checks 4, 5, 6, and 7 pin large, regular and miniature, octal, loctal, Hytron, 9 pin miniature and pilot lamps.
Individual tests on multiple element tubes.
Blank panel socket for obsolescence protection.
Compensation for line voltage variation.
New smooth rolling illuminated roll chart.
Easy to read GOOD-BAD meter scale.
Fourteen Filament voltages - .75 to 117 volts

| | |
|---|---|
| Element Test Voltages | 0-250 volts |
| Dimensions | 14" wide x 11" deep x 4 1/4" high |
| Power Requirements | 105-125 volts 50/60 cycles AC |

# INSTRUMENT DESCRIPTION

The Heathkit model TC-2 Tube Checker was expressly designed for checking tubes encountered in everyday radio and TV service work. It is capable of providing an overall quality test, will indicate shorted elements, open elements and filament continuity. It will check 4, 5, 6, and 7 pin, large, regular and miniature, octal, loctal, Hytron, 9 pin miniature series tubes and pilot lamps. Separate tests for the oscillator section of converter tubes have been provided. A blank socket is arranged on the panel to facilitate modification for checking newly added tube types as protection against obsolescence.

The roll chart contains all necessary data for the checking of currently used tubes. Because of the constantly growing list of tubes, it was decided to eliminate tubes classified as seldom-used, or obsolete, in an effort to hold down the physical length of the roll chart. The information for various settings of the tubes in this particulat classification is supplied on a separate sheet. The Heath Company periodically revises the roll chart in order to provide the latest test information. Announcement of new chart availability is usually made in Heathkit Flyer advertising and replacement charts can be obtained for a nominal charge of fifty cents ($0.50).

One secondary winding of the power transformer is tapped for fourteen different filament voltages which range from .75 volts up to 110 volts. Such an arrangement assures placing the proper filament voltages on the hundreds of tubes listed on the chart and the filament switch makes proper connections.

The other secondary winding has voltage taps of 30 volts, 100 volts and 250 volts, and the various tests use these different voltages. Three basic circuits are set up as the tube is checked and these operate in the following manner.

The first basic circuit is used when making the quality and open checks. In these tests, 30 volts AC are placed across the tube between filament and plate and the tube under test conducts as a half-wave rectifier. The filament and cathode are connected together as are the plate and the grids. The PLATE adjust control adjusts the sensitivity of the BAD-GOOD meter, which is in the circuit at this time. The roll chart gives the setting for PLATE adjust control and a good tube with the sensitivity of the meter properly set will have sufficient cathode emission to swing the meter needle to the GOOD position. If the tube emission is too low, the conducting current of the tube will not be high enough to bring the needle into the GOOD section, rather into the ? or BAD section. Thus the cathode emission is checked.

Basically, the open check works as follows. The plate and all grids connected together will receive a certain amount of electrons from the cathode. The meter reading with this flow is noted. Then, to test each element individually for opens, each of the grids is in turn disconnected and if the element is not open, the current through the meter drops and the reading is less than originally noted. If an element is open, it is recognized because the meter reading does not drop when this element is checked. For tubes with quite a number of grids, the operation is somewhat more complex, but the same theory applies in general. For gas tubes, (OZ4, etc.) the 250 volt tap rather than the 30 volt tap is used. The circuitry remains unchanged.

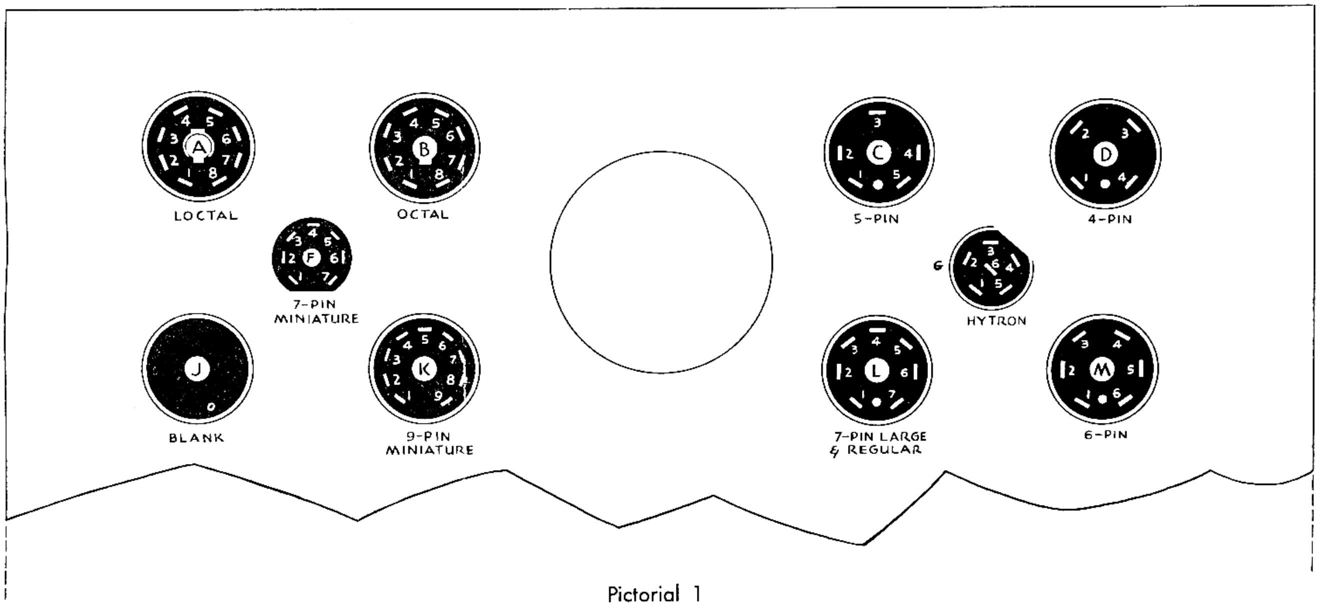
The second basic circuit is used in short and filament continuity test. The 100 volt tap is connected to the neon bulb short indicator and associated network, and is in series with the plate of the tube being tested. The meter is not now in the circuit and the checks are indicated by the neon bulb. Putting the switches in the positions as indicated on the roll chart, connect the various tube elements in such a manner that a shorted element will cause considerable increased current flow through the resistor in parallel with the neon bulb. The voltage drop then produced reaches the operating voltage of the neon bulb, and it glows brightly indicating a short. For the filament tap continuity test, the filament setting is reduced to .75 volts and with continuity the neon bulb will glow.

The third basic circuit is in the SET LINE position. The SET LINE control in the primary of the power transformer, varies the voltage across the primary thereby in turn the secondary voltage. The meter with the voltage divider network and the rectifier now in the circuit will indicate the proper secondary voltage when the needle is set on the SET LINE marking. The purpose of the SET LINE is to assure proper voltages on the tube under test, rather than have false indication as a result of high or low power line voltages.

NOTE: In some sections of the country where AC line supply voltages are somewhat higher than the average, it may be necessary to further compensate for increased voltage by installing a resistor in series with one leg of the transformer primary winding. The exact resistance value required can best be determined experimentally, but it will generally fall between 50 and 100 ohms. Due to the power requirements of the Tube Checker it would be advisable that the resistor have a rating of at least 20 watts and should preferably be of the wire-wound type.

## MECHANICAL ASSEMBLY

Study Pictorial 1 very carefully, and note the placement of various parts. This pictorial shows the aluminum panel as viewed from the rear. Throughout this manual, a system of alphabetical designation will be used for each part, and each terminal connection of the part will be assigned a number. Therefore, the first tube socket in the upper left corner, which is a loctal socket, is designated as A, and the eight pins will be identified as A1, A2, A3, etc. Actually marking the panel openings will prove helpful. This same procedure will be used throughout instrument construction. Please note also that some parts such as the lever switches, have been assigned a dual alphabetical designation, such as EE, FF, GG, etc.



Pictorial 1
Panel Viewed from Rear

Actual assembly will first begin with the mounting of the ten tube sockets. These sockets are of rugged construction and will provide good service under the strain to which they are subjected through the constant insertion and removal of tubes during test procedure. All of these sockets are of ring mounting type for additional strength. When installing these sockets with the ring mounting be sure to make the installation properly so that no difficulty with socket loosening will occur later on after all of the wiring has been installed. When installing sockets be sure to note the keyway designation or the relative locations of the socket pins as shown in Pictorial 1. You will note that in most instances, each pin of the socket has a molded number for quick identification.

An additional wavy ring and lock ring have been provided for your convenience in event a ring should become damaged during construction. Please note that one of the wavy rings is much larger, and this ring should be used only on socket L, which is the large seven-pin socket having the pilot light test socket incorporated in its design.

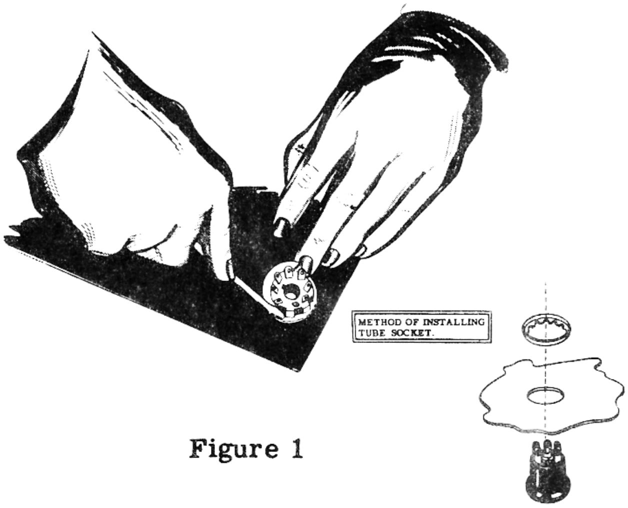

METHOD OF INSTALLING TUBE SOCKET

**Figure 1**

To prevent marring the finish of the Tube Checker panel, it is advisable to place a pad or cloth over the workbench or working surface for protective purposes. Sockets are held in place by a wavy ring which is forced over the back of the socket and into the grooves along the edge as shown in Figure 1.

( ) Mount the seven pin miniature socket in location F. Note placement of flat on side of socket. It is held in place by a small lock ring, which is pressed over the base after it is properly placed in the panel. In event the lock ring fitting is too tight for installation, it might be necessary to bend the teeth upwards slightly with a pair of long-nose pliers.

( ) In a similar manner, mount the five pin Hytron socket in location G. Pay particular attention to the pin numbering on the socket as the flat side of the socket does not correspond with the relative location of the socket previously installed.

( ) Mount the loctal socket in location A, using the wavy ring mounting method previously described. Note keyway placement.

( ) Mount the octal ring in location B. Note keyway placement.

( ) Mount the five pin socket in location C.

( ) Mount the four pin socket in location D.

( ) Mount the blank socket in location J.

( ) Mount the nine pin miniature socket in location K. Note that the blank space in the socket pin ring is placed toward the bottom of the panel.

( ) Mount the large seven pin socket in location L. This socket uses the largest of the wavy rings supplied.

( ) Mount the six pin socket in location M.

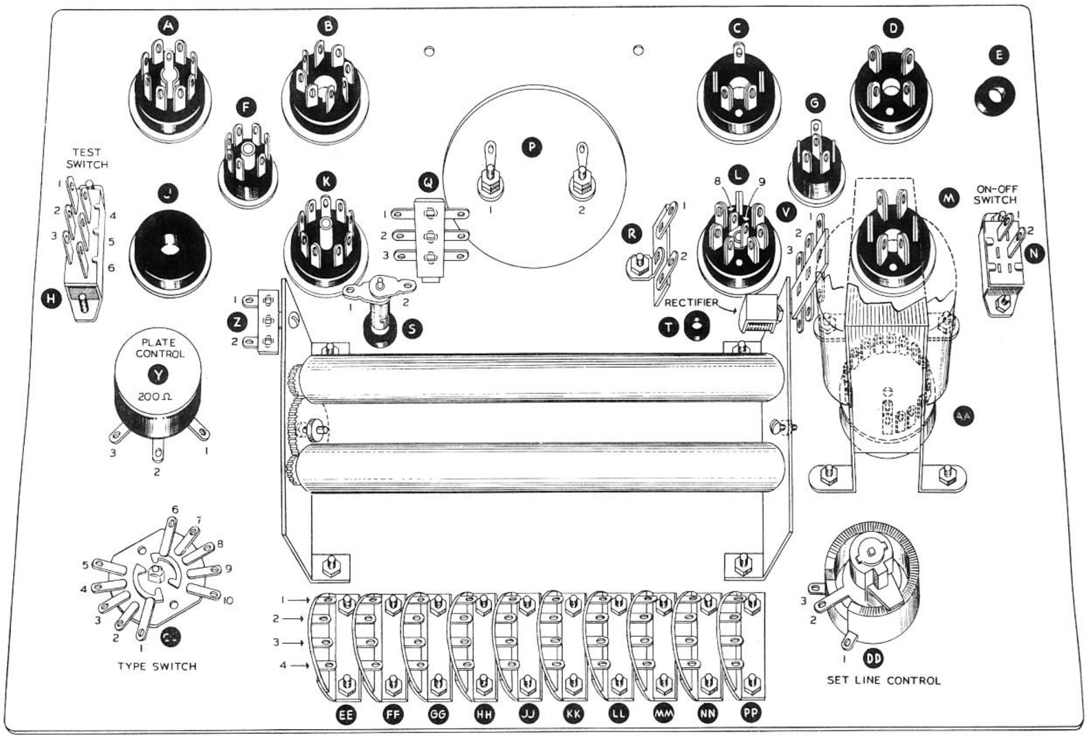
Observe Pictorial 2 for the steps immediately following.

( ) Using 6-32 screws, lockwashers and nuts, mount the **OFF-ON** switch in location N. Use care to see that the lugs are positioned exactly as shown in Pictorial 2.

( ) Mount the double pole double throw spring return slide switch in location H. When mounting this switch, orient it so that the slide button is normally in the **ADJUST LINE SHORT** (see front of panel) position. Use 6-32 screws. No lockwashers or nuts are needed as switch frame is tapped and threaded.

( ) Mount the 200 Ω control in location Y by means of a control lockwasher, control panel washer and nut.

( ) Mount the 14 position rotary switch in location AA with a control lockwasher, control panel washer and nut.



PARTS PLACEMENT AND TERMINAL IDENTIFICATION.

Pictorial 2

HEATHKIT TUBE CHECKER
MODEL TC-2

( ) Mount the two pole four position rotary switch in location CC. Use a control lockwasher, control panel washer and nut. Before tightening the nut, note the flat on the switch shaft and orient the flat so that it is on the side of the shaft opposite the panel designation type 1. This should be done with the switch indexed maximum counter-clockwise. This precaution is observed so that the switch will not be mounted upside down.

( ) Mount the 200 Ω 25 watt control in location DD. Use one nut below the panel when mounting the control, as the locating pin on the control is not used and its thickness must be accounted for. Use a control lockwasher, control panel washer and nut in the same manner as when the other controls were mounted.

( ) Slide the 5/16" rubber grommet in the hole in location T.

( ) Slide the 1/2" rubber grommet in location S.

( ) Slide a 3/8" rubber grommet in location E.

( ) In order to protect the meter face, the meter will not be installed at this time. Since the meter mounting screws are used to mount a two lug and a three lug terminal strip, these terminal strips will be mounted with 6-32 screws and nuts temporarily. These screws and nuts will then be removed later on when the actual installation of the meter is called for.

( ) Mount a three lug vertical terminal strip in location Q.

(✓) In a like manner, mount a two lug terminal strip in location R.

(✓) Observe Pictorial 2 and mount the two lug terminal strip Z on a roll chart bracket. Mount the gear shaft on the same bracket using a #6 lockwasher and a 6-32 nut.

(✓) On the remaining tube chart bracket, install a 6-32 screw, lockwasher and nut in the same relative position as the gear shaft was installed on the first roll chart bracket. The purpose of this screw is to provide a slip on mounting pin for the panel lamp holder, which will later be slipped over both brackets.

(✓) Place the large drive gear on the gear shaft and fasten the angle bracket to the panel using 6-32 hardware.

(✓) Mount the other roll chart bracket in a similar manner. Do not tighten the 6-32 screws at this time, as some play will be required for the mounting of the roll chart in a later step.

## LEVER SWITCH MOUNTING

The ten lever switches should now be mounted in locations EE, FF, GG, etc. When mounting these switches, be sure that the switch frame mounting flange is pointing in the direction shown in Pictorial 2. Because of variations in switch supply, it is possible that some switches may already have tapped mounting frames requiring only the use of 6-32 screws for switch mounting.

In event there is any confusion regarding the mechanical mounting of the lever switches, please inspect the switches very carefully. You will note that one of the four solder lugs is a "common" lug, which can be switched to any one of the three remaining lugs. In all cases, the switch should be mounted so that the "common" lug is toward the roll chart mounting or away from the lower edge of the Tube Checker panel. Reversed switch mounting will result in a short circuit condition which will seriously overload the power transformer and could conceivably cause transformer failure. The importance of correct switch mounting cannot be over-emphasized.

NOTE: In all future correspondence, please be sure to properly identify the particular lever switches used in your kit. They may be any one of the following three major types:

1. JBT; identified by initials JBT on arm assembly, leaf spring detent action and numbered designation SS 141L3.
2. CENTRALAB; identified by frame designation CRL 10938 and coil spring detent action.
3. GRIGSBY-ALLISON; identified by frame designation G-A 5263 and leaf spring detent action.

(✓) Install all ten lever switches in an identical manner with the "common" lug of each switch toward the roll chart assembly. For installation ease start with switch EE and work towards the right.

The preliminary mechanical assembly of the Tube Checker has now been completed with the exception of the installation of the meter, power transformer, and a few other miscellaneous items which will be installed in later steps. The instrument is now ready for basic switch and tube socket wiring. However, before proceeding with the wiring, carefully recheck all assembly up to this point. In event any errors are present, it is much easier to correct them now rather than after all of the wiring is in place.

## SWITCH AND SOCKET WIRING

In order to simplify the detailed but very important wiring between the tube sockets and the lever switches, color coded wire will be used. A four foot length of 8-wire color coded cable has been furnished with this kit. Two lengths of this cable will be required for two separate wiring harnesses. Therefore, measure and cut off a 15" length of 8-wire cable and a 12" length of 8-wire cable. The remaining length of wire cable should now be pulled apart in order to use the individual sections of colored wire. This can be accomplished by cutting a portion of the outer plastic insulation and then removing the wires by pulling them out of the cable one at a time. Do not separate the 15" and 12" lengths of cable previously cut.

To further standardize wiring procedure, the color code used in resistance work will be used as much as possible with the exception of the black and white cable wires. In actual wiring procedure calling for the wiring of pin 1 on all sockets and connecting to the corresponding lever switch the same color wire will be used all the way from the lever switch to pin 1 on all sockets. In this instance, the color of the wire will be brown. For convenience the following code will be used.

1. Brown
2. Red
3. Orange
4. Yellow
5. Green
6. Blue
7. Black
8. White

By installing all wiring using this color code, it will be much easier to trace out all wiring in event trouble shooting should be required at any time.

The 12" and 15" lengths of 8-wire cable will be prepared as separate wiring harnesses before actual installation. If the following instructions are carefully followed, a neat compact wiring job will result.

## CABLE HARNESS PREPARATION

The 15" length of 8-wire cable will be installed first. This should be prepared by removing 5" of outer covering from one end and 3" of outer covering from the other end of the cable. This can be easily accomplished by bending the wire cable at the point where a circular cut will be made through the outer insulation. Use a sharp knife or a razor blade and cut the insulation covering very carefully so as to not damage the insulation on the wires underneath the outer covering. Rotate the cable during the cutting procedure and a very neat job can be obtained. After the circular cut is made, the outer covering can be easily slipped off the cable end without disturbing the wires. Prepare both ends of the 15" cable length in this manner.

Starting with the end of the cable from which the 5" length of insulation was removed, the following wires should be cut to length. Do not cut the brown, red, and orange wires.

( ) Cut off a 1/2" length of the yellow wire.

( ) Cut off a 1" length of green wire.

( ) Cut off a 1 1/2" length of blue wire.

(✓) Cut off a 1 1/2" length of black wire.

(✓) Cut off a 1 1/2" length of white wire.

The remaining lengths of wire at the 5" end of the cable should now be prepared for soldering by removing 1/4" of insulation from the end of each wire. Twist the loose strands together and tin each wire end by using a hot soldering iron being careful not to burn or damage the plastic covering.

Prepare the other end of the 15" cable harness by cutting the following wires.

(✓) Cut off 2" of the brown wire.

(✓) Cut off 2" of the red wire.

(✓) Cut off 2" of the orange wire.

( ) Cut off 1" of the yellow wire.

( ) Cut off 1" of the white wire.

NOTE: The blue and black wires are not cut as the full length will be used.

Prepare this end of the harness by removing 1/4" of the insulation from the end of each wire. Twist the loose strands together and tin the wire by using a hot iron and permitting solder to flow through the strands to form a compact wire end without allowing any excess solder blobs to remain on the wire.

(S) means solder. (NS) means do not solder yet.

(✓) Connect a length of hookup wire to lever switch EE1 (S).

(✓) Dress this wire around the roll chart bracket and across the panel to R1 (NS).

(✓) Connect a length of hookup wire to lever switch FF1 (S).

(✓) Dress the wire around the roll chart bracket to K9 (S).

(✓) The end of the cable harness from which the 5" length of insulation was removed will now be installed to the lever switches starting by connecting the brown wire to PP1 (S).

(✓) Connect the red wire to NN1 (S).

(✓) Connect the orange wire to MM1 (S).

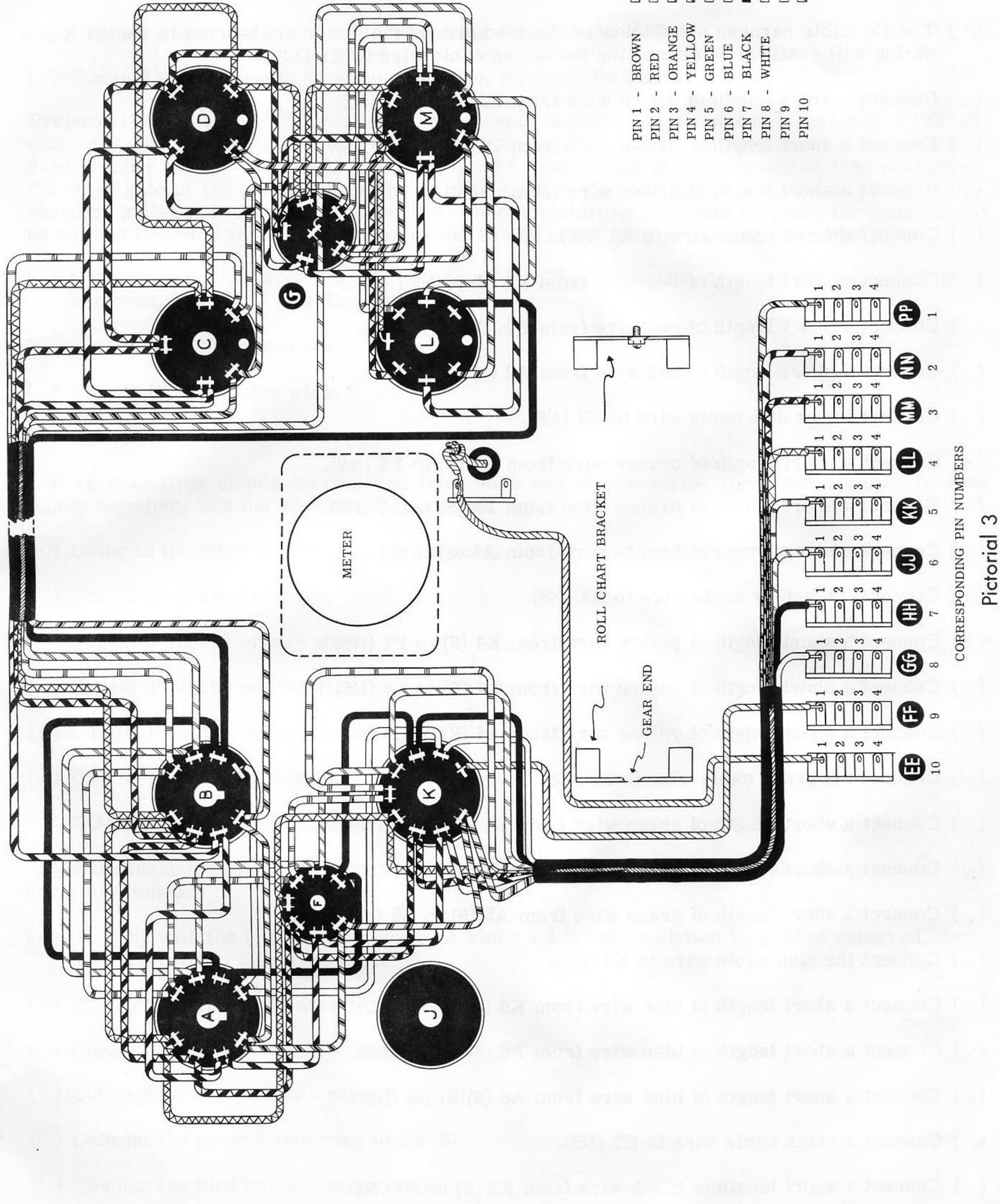
(✓) Connect the yellow wire to LL1 (S).

(✓) Connect the green wire to KK1 (S).

(✓) Connect the blue wire to JJ1 (S).

(✓) Connect the black wire to HH1 (S).

(✓) Connect the white wire to GG1 (S).


PIN 1 - BROWN
PIN 2 - RED
PIN 3 - ORANGE
PIN 4 - YELLOW
PIN 5 - GREEN
PIN 6 - BLUE
PIN 7 - BLACK
PIN 8 - WHITE
PIN 9
PIN 10
D
M
G
C
L
METER
ROLL CHART BRACKET
GEAR END
B
K
F
A
J
PP 1
NN 2
MM 3
LL 4
KK 5
JJ 6
HH 7
GG 8
FF 9
EE 10
1 2 3 4
CORRESPONDING PIN NUMBERS

Pictorial 3
Harness Wiring

Subsequent wiring steps will require the use of the various lengths of assorted colored wire previously separated. In each instance, the length of wire should be roughly determined and will usually be between 2" or 3" long. The insulation should be stripped 1/4" from each end of the wire, the wire twisted, and tinned in the same manner called for in the preparation of the harness.

(✓) The 15" cable harness should now be dressed around the roll chart bracket to socket K and wiring will continue by connecting the brown cable wire to K1 (NS).

(✓) Connect a short length of brown wire from K1 (S) to F1 (NS).

(✓) Connect a short length of brown wire from F1 (S) to A1 (NS).

(✓) Connect a short length of brown wire from A1 (S) to B1 (NS).

(✓) Connect the red cable wire to K2 (NS).

(✓) Connect a short length of red wire from K2 (S) to F2 (NS).

(✓) Connect a short length of red wire from F2 (S) to A2 (NS).

(✓) Connect a short length of red wire from A2 (S) to B2 (NS).

(✓) Connect the orange cable wire to K3 (NS).

(✓) Connect a short length of orange wire from K3 (S) to F3 (NS).

(✓) Connect a short length of orange wire from F3 (S) to A3 (NS).

(✓) Connect a short length of orange wire from A3 (S) to B3 (NS).

(✓) Connect the yellow cable wire to K4 (NS).

(✓) Connect a short length of yellow wire from K4 (S) to F4 (NS).

(✓) Connect a short length of yellow wire from F4 (S) to A4 (NS).

(✓) Connect a short length of yellow wire from A4 (S) to B4 (NS).

(✓) Connect the green cable wire to K5 (NS).

(✓) Connect a short length of green wire from K5 (S) to F5 (NS).

(✓) Connect a short length of green wire from F5 (S) to A5 (NS).

(✓) Connect a short length of green wire from A5 (S) to B5 (NS).

(✓) Connect the blue cable wire to K6 (NS).

(✓) Connect a short length of blue wire from K6 (S) to F6 (NS).

(✓) Connect a short length of blue wire from F6 (S) to A6 (NS).

(✓) Connect a short length of blue wire from A6 (S) to B6 (NS).

(✓) Connect a black cable wire to K7 (NS).

(✓) Connect a short length of black wire from K7 (S) to F7 (NS).

( ) Connect a short length of black wire from F7 (S) to A7 (NS).

( ) Connect a short length of black wire from A7 (S) to B7 (NS).

( ) Connect the white cable wire to K8 (NS).

( ) Connect a short length of white wire from K8 (S) to A8 (NS).

( ) Connect a short length of white wire from A8 (S) to B8 (S).

Prepare the remaining 12" length of 8-wire cable in a similar manner by removing 2 1/2" of outer covering from one end and 4 1/2" of outer covering from the other end. This length of 8-wire cable will be used in making connections from socket B to the group of tube sockets on the other side of the panel. Since the number 8 white wire will not be used it can either be ignored or pulled out of the cable assembly. Before installing the cable harness, the ends should be cut and tinned in the same manner as the 15" length of wire previously installed.

( ) Starting with the cable length from which 2 1/2" of insulation or outer covering have been removed, cut off 1" of yellow wire.

( ) Cut off 1" of the green wire.

( ) Cut off 1" of the blue wire.

( ) Cut off 1" of the black wire.

1/4" of insulation should be removed from each end of the wires, the loose strands twisted tightly together, and the wire carefully tinned.

( ) Going to the other end of the wire harness, cut off 3" of the brown wire.

( ) Cut off 3" of the red wire.

( ) Cut off 3" of the orange wire.

( ) Cut off 2" of the yellow wire.

( ) Cut off 1" of the green wire.

( ) Cut off 1" of the blue wire.

DO NOT cut the black wire.

Again the insulation should be removed from the wire ends, the loose strands tightly twisted and carefully tinned.

( ) Starting with the end of the cable from which 2 1/2" of insulation have been removed, connect the brown cable wire to B1 (S).

( ) Connect the red cable wire to B2 (S).

( ) Connect the orange cable wire to B3 (S).

( ) Connect the yellow cable wire to B4 (S).

( ) Connect the green cable wire to B5 (S).

( ) Connect the blue cable wire to B6 (S).

(✓) Connect the black cable wire to B7 (S).

NOTE: There is no connection to B8 as far as this particular cable installation is concerned.

(✓) Dress the harness across the top of the panel to socket C and connect the brown cable wire to C1 (NS).

(✓) Connect a short length of brown wire from C1 (S) to D1 (NS).

(✓) Connect a short length of brown wire from D1 (S) to G1 (NS).

(✓) Connect a short length of brown wire from G1 (S) to M1 (NS).

(✓) Connect a short length of brown wire from M1 (S) to L1 (S).

(✓) Connect the red cable wire to C2 (NS).

(✓) Connect a short length of red wire from C2 (S) to D2 (NS).

(✓) Connect a short length of red wire from D2 (S) to G2 (NS).

(✓) Connect a short length of red wire from G2 (S) to M2 (NS).

(✓) Connect a short length of red wire from M2 (S) to L2 (S).

(✓) Connect the orange cable wire to C3 (NS).

(✓) Connect a short length of orange cable wire from C3 (S) to D3 (NS).

(✓) Connect a short length of orange wire from D3 (S) to G3 (NS).

(✓) Connect a short length of orange wire from G3 (S) to M3 (NS).

(✓) Connect a short length of orange wire from M3 (S) to L3 (S).

(✓) Connect the yellow cable wire to C4 (NS).

(✓) Connect a short length of yellow wire from C4 (S) to D4 (NS).

(✓) Connect a short length of yellow wire from D4 (S) to G4 (NS).

(✓) Connect a short length of yellow wire from G4 (S) to M4 (NS).

(✓) Connect a short length of yellow wire from M4 (S) to L4 (S).

(✓) Connect the green cable wire to C5 (NS).

(✓) Connect a short length of green wire from C5 (S) to G5 (NS).

(✓) Connect a short length of green wire from G5 (S) to M5 (NS).

(✓) Connect a short length of green wire from M5 (S) to L5 (S).

(✓) Connect the blue cable wire to G6 (NS). (G6 is the center terminal of the Hytron socket.)

(✓) Connect a short length of blue wire from G6 (S) to M6 (NS).

(✓) Connect a short length of blue wire from M6 (S) to L6 (S).

(✓) Connect the black cable wire to L7 (S).

You have now completed all of the wiring between the tube sockets and lever switches which will permit individual switch selection of any tube element. This represents the major portion of the Tube Checker instrument wiring and it is very important that all of the wiring be correctly done. May we suggest that at this time you recheck all connections to the various tube socket terminals to make sure that no loose strands of wire, cuttings, or blobs of solder can cause a short circuit. Dress all the wiring neatly away from each socket terminal and press the wiring down toward the panel.

To carry the test further, the use of an ohmmeter between terminal 1 of each lever switch and the corresponding socket terminals will indicate proper continuity. In a similar manner, short circuits between lever switch terminals, socket terminals, or even grounding to the panel can be detected. The importance of correctly installing this wiring cannot be over-emphasized.

## FINAL ASSEMBLY AND WIRING

(✓) Referring to Pictorial 2 mount the meter rectifier and the 3 lug vertical terminal strip in the position shown on the roll chart bracket. (Straighten the L-shaped terminal mounting to permit vertical placement.)

(✓) Place the neon bulb in the bayonet socket and slide the bulb into grommet S. See Figure 2.

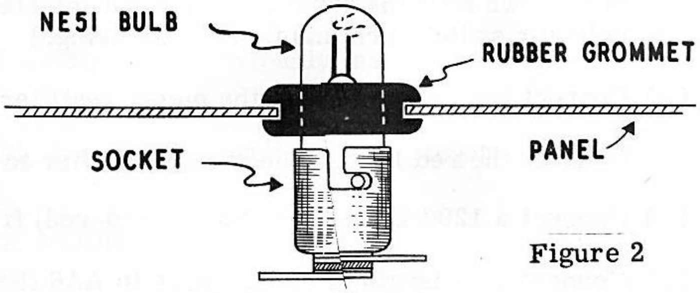


Figure 2

(✓) Run a wire from S1 (S) to Q1 (S).

(✓) Connect a 270 KΩ resistor (red-purple-yellow) between Q2 (S) and Q3 (NS).

(✓) Run a wire from S2 (S) to Q2 (NS).

(✓) Connect a 100 KΩ resistor (brown-black-yellow) from Q1 (S) to Q3 (NS).

(✓) Referring again to the ten lever switches, bend lugs 2, 3, and 4 slightly upward on all ten switches.

(✓) Dress a length of bare wire through all terminal 2 switch lugs.

(✓) Dress a similar length of bare wire through all terminal 3 switch lugs.

(✓) Dress a third length of bare wire through all terminal 4 switch lugs.

(✓) Carefully solder all terminal connections with the exception of connections on switches EE2, EE4 and PP2, PP3. These terminals are not soldered at this time as additional connections will be made to these switch solder lugs. When soldering the terminals, be sure to use a hot iron and flow the solder smoothly into each joint. so that a good electrical bond exists. Avoid excessive use of solder which could conceivably cause a switch flooding condition.

(✓) Refer to Pictorial 2 for placement of switch H.

(✓) Run a wire from H1 (S) to Q2 (S).

(✓) Run a wire from H2 (S) to switch CC1 (S).

(✓) Run a wire from H4 (S) to EE4 (S).

(✓) Run a wire from H5 (S) to V2 (NS).

(✓) Run a wire from H6 (S) to CC10 (NS).

(✓) Run a wire from plate control Y3 (S) to EE2 (S).

(✓) Connect a 360 Ω 5% resistor (orange-blue-brown) from CC10 (NS) to CC9 (S).

(✓) Connect one lead of a 1500 Ω 5% resistor (brown-green-red) to CC10 (S), and pass the other lead of the resistor through CC8 (S) and continue to CC7 (S).

(✓) Connect an 820 Ω 5% resistor (gray-red-brown) between CC3 (NS) and CC4 (S).

(✓) Connect a 3600 Ω 5% resistor (orange-blue-red) between CC3(NS)and CC5 (S).

(✓) Moving to socket L, connect a length of hookup wire from L8 (S) to PP3 (NS). Dress this wire around the end of the tube bracket and close to the panel.

(✓) Connect another wire from L9 (S) to PP2 (NS) dressing the wire in a similar manner. Avoid excessive use of solder when connecting to L8 and L9 to prevent shorting at the terminal base.

(✓) Connect a wire from the filament selector switch AA15 (S) to PP3 (S).

( ) Install the 75 KΩ precision resistor from AA1 (NS) to V1 (NS). Dress this resistor placement down near the panel so it will not interfere with wiring to be connected to the filament selector switch terminals. (Use sleeving.)

(✓) Connect the yellow lead of the meter rectifier to V2 (S).

(✓) Connect the red lead of the meter rectifier to V1 (NS).

(✓) Connect a 1200 Ω resistor (brown-red-red) from V1 (S) to V3 (NS).

(✓) Connect a 6" length of hookup wire to AA8 (NS). The other end of this hookup wire will be connected to the panel light assembly in a later step.

At this stage of assembly, the roll chart should be mounted in the following manner. Place brass washers on the two wood roller spindle ends opposite the gear end. Loosen the chart very slightly and install face down with the printed surface against the panel opening. Be sure to first slip the chart under the hub of the drive gear. The two spindle ends on which the brass washers were previously installed should now be slipped into place in the roll chart bracket. The gear end of the wood rollers should now be slipped into place on the other roll chart mounting bracket, being certain that the gears properly mesh.

The mounting of the angle bracket assembly to panel should now be checked before the mounting screws are tightened. You will note that the openings in the roll chart angle bracket mounting flanges are elongated to permit some range of adjustment. The purpose of this adjustment range is to prevent undue lateral motion of the roll chart assembly.

The roll chart should roll smoothly and freely from one end of its length of travel to the other without diagonal running or binding. If the chart is loose on the roller, there will be too much play in the action. If too tight, the chart will bind, usually at either end of its travel.

Adjust angle bracket mounting so that thumbwheel drive does not bind. Roller spindles may be lightly lubricated with fine oil.

## PANEL LAMP BRACKET

(✓) Install two 1/2" rubber grommets in the panel lamp bracket.

(✓) Install two #47 pilot lamps in their respective bayonet bases.

(✓) Moisten the glass surface of the panel lamps for easy installation. Push them through the rubber grommets until the bayonet pin portion of the lamp and socket engage the grommet.

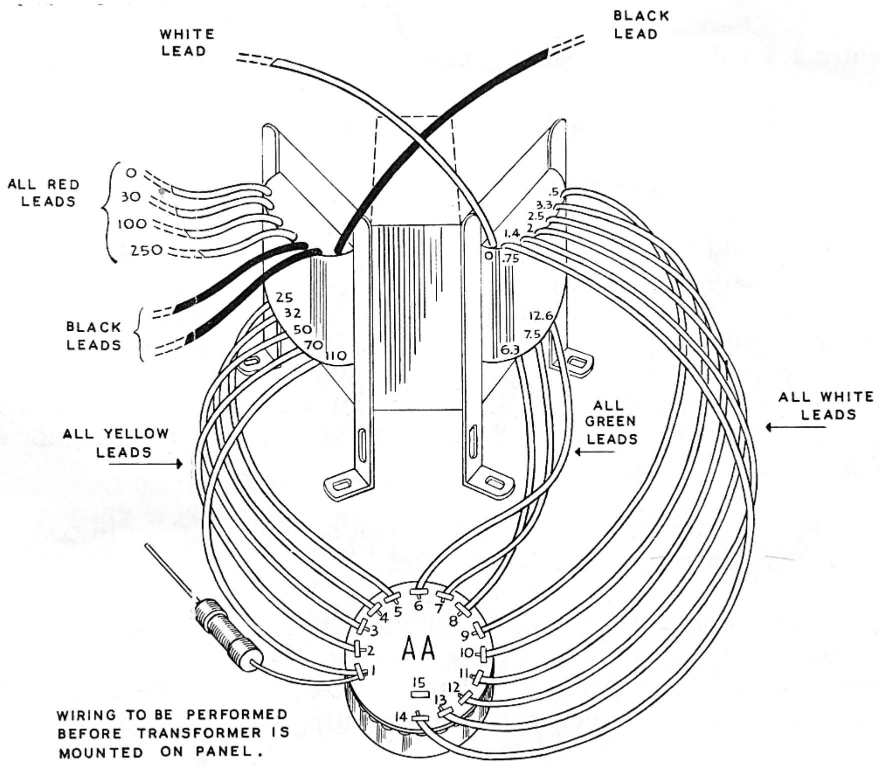
(✓) Turn the panel lamp sockets so that the solder lugs are parallel to each other and connect short lengths of hookup wire between terminals 1 (S) of each socket and terminals 2 (S) of each socket. The pilot light bracket can now be installed by slipping the 5-32 mounting hole in one bracket end over the roll chart bracket opposite the bracket with the gear mounting. The bracket mounting hole should be slipped over the end of the 6-32 screw and nut previously installed in the same relative location as the gear shaft mounting on the other bracket. The remaining end of the pilot light bracket should be slipped over the 6-32 stud mounting for the main drive gear.

Please note that the free mounting of the pilot light bracket is deliberate. The bracket should not be bolted or fastened to either of the studs and is held in place by the slip-on method of installation. As the roll chart is rotated from one end of its travel to the other, the pilot lamp bracket will rock slightly and act as a chart guide. It might be necessary to adjust the mounting tension of the panel lamp bracket and this can be accomplished by slight bending of the end pieces.

(✓) Connect the free end of the short length of hookup wire previously installed to AA8 to one of the pilot light socket terminals (S).

(✓) From the other pilot light socket terminal, connect a short length of hookup wire to PP2 (NS). Refer to Pictorial 5.

## POWER TRANSFORMER MOUNTING AND WIRING


WHITE LEAD
BLACK LEAD
ALL RED LEADS
0
30
100
250
BLACK LEADS
25
32
50
70
110
.5
3.3
2.5
2
1.4
0
.75
12.6
7.5
6.3
ALL GREEN LEADS
ALL WHITE LEADS
ALL YELLOW LEADS
AA
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
WIRING TO BE PERFORMED BEFORE TRANSFORMER IS MOUNTED ON PANEL.

Pictorial 4
Expanded View of Power Transformer Wiring

The power transformer should be inspected, and you will note that the leads are color coded as well as marked on the paper wrapper around the windings. Straighten the leads and identify each lead. During this process handle the transformer leads with care. Although they are firmly anchored, it would be wise to avoid unnecessary difficulty that might be caused through undue tension on the leads. If an ohmmeter is available, it would be advisable to check transformer continuity at this time. The power transformer is partially wired into the circuit before it is mounted. Follow Pictorial 4 carefully and do not cut the leads. They are of the proper length to be easily connected into the circuit.

( ) Connect the yellow 110 volt lead to AA1 (S).

( ) Connect the yellow 70 volt lead to AA2 (S).

( ) Connect the yellow 50 volt lead to AA3 (S).

( ) Connect the yellow 32 volt lead to AA4 (S).

( ) Connect the yellow 25 volt lead to AA5 (S).

( ) Connect the green 12.6 volt lead to AA6 (S).

( ) Connect the green 7.5 volt lead to AA7 (S).

( ) Connect the green 6.3 volt lead to AA8 (S).

( ) Connect the white 5 volt lead to AA9 (S).

( ) Connect the white 3.3 volt lead to AA10 (S).

( ) Connect the white 2.5 volt lead to AA11 (S).

( ) Connect the white 2 volt lead to AA12 (S).

( ) Connect the white 1.4 volt lead to AA13 (S).

( ) Connect the white .75 volt lead to AA14 (S).

The white 0 volt lead is left unconnected at this time.

The power transformer should now be mounted above switch AA. In mounting each of the power transformer flanges, slide a 6-32 screw through the proper hole in the panel, set the transformer flange over the screw, slip a plain washer and a lockwasher over the screw and fasten with a 6-32 nut. Repeat this procedure for the other three flanges. Before tightening the screws, stand the Tube Checker panel on its end so that the weight of the transformer will allow the slotted flanges to slide away from the roll chart bracket assembly. This is done to provide as much clearance as possible between the pilot lamp bracket and the transformer winding. Firmly tighten the 6-32 screws and nuts.

NOTE: If necessary the transformer mounting legs can be bent slightly in order to increase the clearance between the transformer and pilot bracket.

Before proceeding further, check all wiring in the vicinity of the transformer mounting. Make sure that the wiring has not been pinched between the panel and transformer mounting flanges. Dress excess transformer lead wiring underneath the power transformer so that it will not interfere with the necessary clearance required for mounting the panel to the Tube Checker cabinet.

( ) Connect the red 0 volt power transformer lead to Y1 (NS).

( ) Run a wire from Y1 (S) to CC6 (S).

( ) Connect a red 30 volt power transformer lead to CC3 (S).

( ) Connect the red 100 volt lead to R2 (NS). (The red 250 volt lead is left unconnected at this time.)

( ) Mount the .1 μfd condenser between R2 (S) and Q3 (S).

( ) Connect the black 0 volt transformer lead to N2 (S).

( ) Connect the black 100 volt transformer lead to DD3 (S).

( ) Connect the black 125 volt power transformer lead to DD1 (S).

( ) Connect the white 0 volt transformer lead to PP2 (S).

( ) Connect the 2500 Ω 5 watt wire-wound resistor between Z1 (NS) and Z2 (NS).

( ) Run a wire from Z2 (S) to CC2 (S).

( ) Connect the red 250 volt power transformer lead to Z1 (S).

( ) Study Figure 3 and mount the grid clip on the grid clip test lead. Note that the metal clip section should be pulled out of the bakelite cap and the conductor of the test lead soldered to it. Do not use excessive solder as the clip is pushed back into the bakelite housing after the soldering has been completed.

NOTE: This clip will accomodate both sizes of grid caps found on radio receiving tubes.

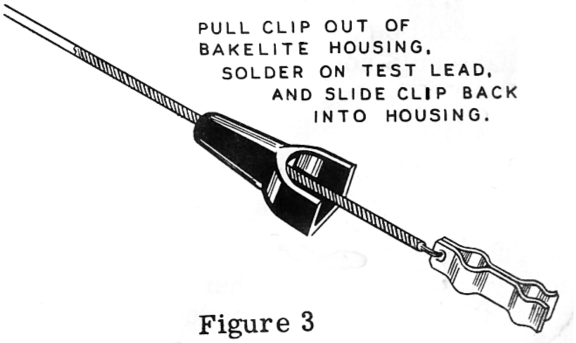

PULL CLIP OUT OF BAKELITE HOUSING. SOLDER ON TEST LEAD, AND SLIDE CLIP BACK INTO HOUSING.

Figure 3

( ) Dress the flexible grid clip wire through the small rubber grommet T from the panel side of the Tube Checker, remove 1/4" of insulation from the end of the wire, and tie the wire in a simple overhand knot about 1 1/2" from the end. Connect the flexible wire to R1 (S).

( ) Pass the line cord through panel grommet E. Knot the cord as shown, and allow sufficient length to fasten one lead to DD2 (S) and the other lead to N1 (S).

## METER MOUNTING

The 4 1/2" meter should now be removed from its carton for panel installation. First it will be necessary to remove the 6-32 screws and nuts which were temporarily installed to hold the two lug terminal strip R and the three lug terminal strip Q in place. Install the meter in the panel opening and slip the two and three lug terminal strips over the meter mounting studs. Use #6 lockwashers and 6-32 nuts to fasten the meter in place.

( ) Connect a length of hookup wire from H3 (S) to meter terminal P2 (S).

( ) Connect a length of hookup wire from Y2 (S) to meter terminal P1 (NS).

( ) Connect a length of hookup wire from V3 (S) to meter terminal P1 (S).

This completes instrument construction and the knobs can now be installed on the panel controls. Install the large pointer knobs on the filament switch and the plate control. Index the filament switch knob so that in maximum counterclockwise position it indexes at the .75 volt position, and in maximum clockwise position it indexes at the 100-115 volt position. Install the plate control knob so that at its maximum counterclockwise position it indexes at zero, and in maximum clockwise position it indexes at 100. The SET LINE and TYPE knobs should also be installed in a similar manner. The lever switch buttons should now be installed on the lever switches. Inspection of the switch buttons will show that they must be correctly positioned before being pushed down on the switch arms. Two additional buttons have been supplied with your kit to be used as spares. Retain them for possible future use.

## PRELIMINARY TESTS

Plug the line cord into a 117 volt AC 50 to 60 cycle supply source. Never use 25 cycle or DC supply voltage, as the power transformer will suffer severe damage. Turn the panel switch to its ON position. The roll chart panel lamps should immediately light, and the meter pointer will deflect to mid-scale. With the use of the SET LINE control, it should be possible to adjust the meter pointer to the meter line test position. It is normal for the range of adjustment to be on the high side of the meter, rather than toward the low end. This is understandable in view of the fact that when heavy current drain tubes, such as rectifiers drawing 2 and 3 amperes on the filament, are being tested, the reading will drop somewhat and it will be necessary for the SET LINE control to be readjusted to the line test position.

If the neon short lamp lights up during any of these preliminary tests, turn the Tube Checker off immediately and systematically trouble-shoot the circuit for possible cause of difficulty. The short test should not indicate any glow during the preliminary test procedure if the instrument is correctly wired. Should difficulty be encountered, a voltage check of the power transformer would be helpful. Use an AC voltmeter and refer to the schematic for the proper voltages that would normally be obtained at the various windings.

If preliminary tests indicate that the Tube Checker is functioning, the action of the checker can be further tested by making actual tests on a variety of tubes that may be available.

## CABINET INSTALLATION

The Tube Checker can now be installed in the cabinet or carrying case. When the panel is in place, you will note that there has been a slight space provided between the cabinet wall and the edge of the panel to accomodate any small variations that may occur. After properly centering the panel, small holes should be drilled in the wood corner supports, so that the panel mounting screws can be installed. If a drill is not available, a starting hole can usually be made with a small, sharp screwdriver or a small awl.

## USING THE HEATHKIT TC-2 TUBE CHECKER

The Heathkit Tube Checker will provide a number of varied tests and these are outlined in the steps below. The following steps should always be used as a guide in setting up tube testing procedure.

(1) With power cord connected, move roll chart to listing of the tube to be tested, and turn SET LINE control until meter pointer is at LINE TEST point.

(2) Set the TYPE switch to the number shown on the chart.

(3) Set the FILAMENT selector to the voltage shown.

(4) Set the PLATE control according to chart information.

(5) Set LEVER switches to TOP and BOTTOM positions as shown in top and bottom columns in chart.

(6) Insert tube and re-set the SET LINE control if necessary.

(7) Check tube for short by moving levers shown in light type through the two positions returning to the positions shown on chart. A shorted tube is indicated by a steady glow of the neon bulb. Disregard neon bulb flashing as lever switches are moved. It is possible that some serious short circuits, such as plate to filament, will momentarily overload the power transformer. This condition will be indicated by complete dim out of the panel lamps. Do not allow the Tube Checker to operate under this extreme condition for any length of time. Make the test as quickly as possible in order to obtain the desired information.

(8) Check tube for quality test by moving the test slide switch to TEST position after allowing sufficient time for the tube to reach operating temperature. If the meter pointer falls in the GREEN scale, the quality of the tube is GOOD.

## TO TEST FOR OPEN ELEMENTS, PROCEED AS FOLLOWS:

(1) Holding slide switch in TEST position, move each lever in the TOP position (only those in light type) to the BOTTOM position and return. Satisfactory tube elements (those properly connected to their pins) are indicated by a change in meter reading. The grid element usually shows a large change, while a screen or plate show only a slight change.

NOTE: If the meter indication in the quality test (step 8) is off scale, reduce the meter reading to an on-scale reading by turning the PLATE control, then proceed with the open element test.

## TO CHECK FILAMENTS, FILAMENT TAPS, INTERNAL CONNECTIONS FOR CONTINUITY:

Set FILAMENT selector switch to .75. Move each lever shown in dark type through each of its other two positions. Always move only one lever at a time. Satisfactory filaments, taps and internal connections will be shown by a bright glow of the SHORT test indicator.

## MULTIPLE TUBE TYPES:

Tubes which contain several sets of elements are indicated on the chart by a bracket set of listings, one for each test to be made on the tube. The tester is set up according to the tests in each line and checked through all of the tests as outlined above.

## PILOT LIGHTS:

Check pilot lights by setting the FILAMENT selector switch to the proper voltage and inserting the pilot light in the socket found in the center of the seven pin socket. This is a universal contact-type pilot light test socket and does not require that the lamp be permanently inserted. It is merely necessary to hold the pilot lamp so that the side wall of the base and the center pin of the lamp make contact with the corresponding points in the lamp socket.

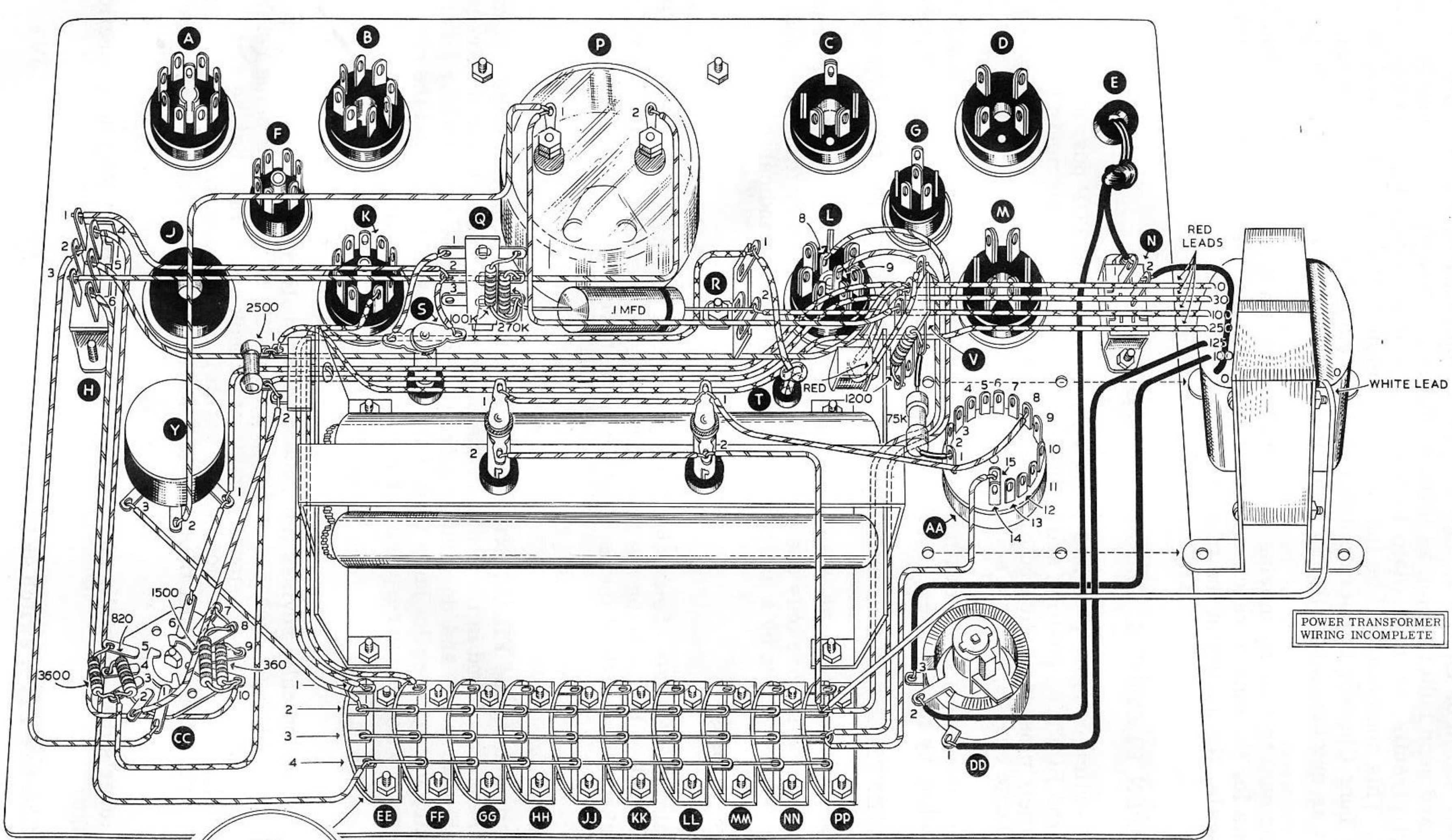
## NEW TUBES:

The Heath Company periodically revises the Tube Checker roll chart in order to keep abreast of new tube releases. However, because of the great quantity of new tubes being released by manufacturers, a customer will occasionally desire to check a new tube before the test data appears on the roll chart. The instructions below will tell exactly how to set up the instrument for obtaining temporary settings so that these new tubes may be checked provided manufacturer's data is available.

(a) Note manufacturer's data carefully concerning the base diagram of the pin connections and filament voltage.

(b) Set the Tube Checker TYPE switch as follows:

Type 1 - for low cathode current tubes (below 4 ma) usually diode type tubes.


A
B
C
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L
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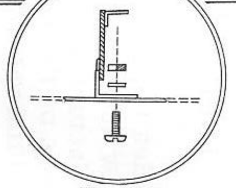
N
P
Q
R
S
T
V
Y
AA
CC
DD
EE
FF
GG
HH
JJ
KK
LL
MM
NN
PP
RED LEADS
WHITE LEAD
RED
.1 MFD
2500
100K
270K
1200
75K
1500
820
3600
360
0
30
100
25
125
10

POWER TRANSFORMER WIRING INCOMPLETE



SIDE VIEW
Lever Switch Mounting

FINAL ASSEMBLY AND WIRING AFTER INSTALLATION OF TUBE SOCKET SWITCH HARNESS WIRING.

Pictorial 5

Type 2 - for cathode current tubes between 3 ma and 15 ma. These are usually filament type tubes with the exception of diodes.
Type 3 - for cathode current type tubes greater than 8 ma. These are usually indirectly heated cathode types with the exception of diodes.
Type 4 - for gas control tubes, gaseous rectifiers, and eye or target tubes.

(c) Set filament voltage to values specified by manufacturer.

(d) Set all levers to the center position.

(e) Determine the first filament connection from the tube base diagram and leave its connection lever in the center position. Its connection lever can be found as follows: Lever A corresponds to pin 1. Lever B to pin 2. Lever C to pin 3, etc.

(f) Determine the second filament connection from the tube base diagram and set its connection lever to the B (bottom) position.

(g) Determine from base diagram if tube has a filament tap, and if so, set connection lever corresponding to tap to the B (bottom) position. Also determine from base diagram if tube has panel lamp.

(h) If the tube has more than one section (duo diodes, duo triodes, etc.) make a separate test for each section. For the section being tested follow instructions below. For the section not being tested, move all corresponding connection levers to the B (bottom) position. If tube has only one section, follow instructions below.

(i) Move the connection lever corresponding to the cathode to the B (bottom) position.

(j) Move all other elements of the section being tested (screens, supressors, grids, plate, etc.) to the T, top position.

(k) Plug tube into correct socket.

(l) Plug instrument into 105-125 volt, 50-60 cycle outlet and turn power on.

(m) Adjust SET LINE control so that the meter indicates line test.

(n) Hold the adjust line short-test switch in the test position and adjust plate voltage control to bring the pointer to the middle of the good scale. (If possible, make this adjustment for at least three new tubes and select the average setting.)

(o) List all these settings in the manual.

(p) If the tube is of the multi-section type check the remaining sections in the manner outlined above and list the settings in the manual.

SPECIAL SOCKET:

The Heath Company can supply a special acorn socket which can be installed in the blank socket panel position. The acorn socket is available from the Heath Company for a nominal charge of $0.75, including installation and wiring instructions. It will be necessary to enlarge the blank socket panel opening slightly by using a file, and to drill two mounting holes for the acorn socket. In testing tubes of more than one top contact, a small grid clip lead can be made with a phone tip on the other end which can be inserted in a vacant socket contact and connected into the tester with the proper lever switch.

## IN CASE OF DIFFICULTY

1. Recheck wiring. Follow each lead on the schematic with a colored pencil and trace it out on the instrument following the color code. Most cases of difficulty result from wrong or reversed connections. (Often having a friend check the wiring will reveal an error consistently being overlooked.)

2. Check the voltages as shown on the transformer wrapper at the connections of the transformer leads. This information is duplicated on the instrument schematic. This will show up mis-interpretation of the transformer lead identification.

3. Make continuity check between lever switch rotor contacts and various socket pins to make certain that all contacts are connected to levers.

4. The SET LINE control normally operates at a rather high temperature and affects part of its cooling through the aluminum panel. This does not indicate a fault.

5. If you are unable to locate the difficulty, write to the Heath Company technical consultation service department supplying all possible pertinent information. Include voltage data, as well as any characteristic of operation that may afford a clue to the difficulty. Trained, technical correspondents will analyze the problem and suggest the corrective measures that may be required.

## REPLACEMENTS

Material supplied with Heathkits has been carefully selected to meet design requirements and ordinarily will fulfill its function without difficulty. Occasionally improper instrument operation can be traced to a faulty tube or component. Should inspection reveal the necessity for replacement, write to the Heath Company and supply all of the following information:

A. Thoroughly identify the part in question by using the part number and description found in the manual parts list.
B. Identify the type and model number of kit in which it is used.
C. Mention the order number and date of purchase.
D. Describe the nature of defect or reason for requesting replacement.

The Heath Company will promptly supply the necessary replacement. Please do not return the original component until specifically requested to do so. Do not dismantle the component in question as this will void the guarantee. If tubes are to be returned, pack them carefully to prevent breakage in shipment as broken tubes are not eligible for replacement. This replacement policy does not cover the free replacement of parts that may have been broken or damaged through carelessness on the part of the kit builder.

## SERVICE

In event continued operational difficulties of the completed instrument are experienced, the facilities of the Heath Company Service Department are at your disposal. Your instrument may be returned for inspection and repair for a service charge of $5.00 plus the cost of any additional material that may be required. THIS SERVICE POLICY APPLIES ONLY TO COMPLETED INSTRUMENTS CONSTRUCTED IN ACCORDANCE WITH THE INSTRUCTIONS AS STATED IN THE MANUAL. Instruments that are not entirely completed or instruments that are modified in design will not be accepted for repair. Instruments showing evidence of acid core solder or paste fluxes will be returned not repaired.

The Heath Company is willing to offer its full cooperation to assist you in obtaining the specified performance level in your instrument. Factory repair service is available for a period of one year from the date of purchase or you may contact the Engineering Consultation Department by mail. For information regarding the possible modification of existing kits, the volumes listed in the Bibliography section are recommended. They can be obtained at or through your local library, as well as at any electronic outlet store. Although the Heath Company sincerely welcomes all comments and suggestions, it would be impossible to design, test, evaluate and assume responsibility for proposed circuit changes for specific purposes. Therefore, such modifications must be made at the discretion of the kit builder according to information which will be much more readily available from some local source.

## SHIPPING INSTRUCTIONS

Before returning a unit for service, be sure that all parts are securely mounted.

ATTACH A TAG TO THE INSTRUMENT GIVING NAME, ADDRESS AND TROUBLE EXPERIENCED.

Pack in a rugged container, preferably wood, using at least three inches of shredded newspaper or excelsior on all sides. DO NOT SHIP IN THE ORIGINAL KIT CARTON AS THIS CARTON IS NOT CONSIDERED ADEQUATE FOR SAFE SHIPMENT OF THE COMPLETED INSTRUMENT. Ship by prepaid express if possible. Return shipment will be made by express collect. Note that a carrier cannot be held liable for damage in transit if packing, in HIS OPINION, is insufficient.

## SPECIFICATIONS

All prices are subject to change without notice. The Heath Company reserves the right to discontinue instruments and to change specifications at any time without incurring any obligation to incorporate new features in instruments previously sold.

## WARRANTY

Heath Company warrants that for a period of three months from the date of shipment, all Heathkit parts shall be free of defects in materials and workmanship under normal use and service and that in fulfillment of any breach of such warranty, Heath Company shall replace such defective parts upon the return of the same to its factory. The foregoing warranty shall apply only to the original buyer, and is and shall be in lieu of all other warranties, whether express or implied and of all other obligations or liabilities on the part of Heath Company and in no event shall Heath Company be liable for any anticipated profits, consequential damages, loss of time or other losses incurred by the buyer in connection with the purchase, assembly or operation of Heathkits or components thereof. No replacement shall be made of parts damaged by the buyer in the course of handling or assembling Heathkit equipment.

NOTE: The foregoing warranty is completely void and we will not replace, repair or service instruments or parts thereof in which acid core solder or paste fluxes have been used.

HEATH COMPANY

## BIBLIOGRAPHY

Spangenberg, K. R.; Vacuum Tubes
Brans, P. H.; World's Radio Tubes

# PARTS LIST

# HEATHKIT TUBE CHECKER

## MODEL TC-2

| PART No. | PARTS Per Kit | DESCRIPTION |
|---|---|---|
| Resistors | | |
| 1-5 | 1 | 360 Ω 5% |
| 1-79 | 1 | 820 Ω 5% |
| 1-80 | 1 | 1200 Ω 5% |
| 1-81 | 1 | 1500 Ω 5% |
| 1-82 | 1 | 3600 Ω 5% |
| 1-26 | 1 | 100 KΩ |
| 1-30 | 1 | 270 KΩ |
| 2-21A | 1 | 75 KΩ precision |
| 3-1E | 1 | 2500 Ω 5 watt wirewound |
| Condensers-Switches-Controls | | |
| 11-14 | 1 | 200 Ω 25 watt |
| 11-12 | 1 | 200 Ω wirewound |
| 23-11 | 1 | .1 μfd tubular |
| 60-1 | 1 | SPST slide switch |
| 60-3 | 1 | DPDT spring return slide |
| 62-1 | 10 | SP, 3 position lever |
| 63-14 | 1 | SP, 14 position rotary |
| 63-17 | 1 | 2-pole, 4 position rotary |
| Knobs-Sockets-Terminal Strips | | |
| 412-1 | 2 | #47 panel lamp |
| 412-3 | 1 | NE51 bulb |
| 431-2 | 2 | 2 lug terminal strip |
| 431-4 | 2 | 3 lug terminal strip |
| 434-1 | 1 | Blank socket |
| 434-4 | 1 | Octal socket |
| 434-9 | 1 | 4 prong socket |
| 434-10 | 1 | Hytron 5 prong socket |
| 434-11 | 1 | 5 prong socket |
| 434-12 | 1 | 6 prong socket |
| 434-13 | 1 | 7 prong socket |
| 434-14 | 1 | 7 prong miniature socket |
| 434-6 | 1 | Loctal socket |
| 434-17 | 1 | 9 prong miniature socket |
| 434-21 | 3 | Pilot light socket |
| 435-1 | 8 | Octal socket rings |
| 435-2 | 3 | Miniature socket rings |
| 435-3 | 1 | Large socket ring |
| 100-M54 | 2 | Large knob |
| 462-7 | 12 | Lever switch knob |
| 462-19 | 2 | Small skirted knob |

| PART No. | PARTS Per Kit | DESCRIPTION |
|---|---|---|
| Hardware | | |
| 250-9 | 35 | 6-32 x 3/8 screw |
| 250-12 | 4 | #6 x 5/8 sheet metal screw |
| 252-3 | 37 | 6-32 x 1/4 nut |
| 252-7 | 4 | Control nut |
| 253-8 | 4 | #10 Flat washer |
| 253-9 | 2 | #8 Washer |
| 253-10 | 4 | Flat nickel washer |
| 254-1 | 36 | #6 lockwasher |
| 254-4 | 4 | Control lockwasher |
| Wire-Grommets | | |
| 73-1 | 1 | 3/8 grommet |
| 73-3 | 3 | 1/2 grommet |
| 73-4 | 1 | 5/16 grommet |
| 89-1 | 1 | Line cord |
| 340-2 | 1 | length Bare wire |
| 341-1 | 1 | Grid clip test lead |
| 344-1 | 1 | roll Hookup wire |
| 346-1 | 1 | length Insulated sleeving |
| 347-1 | 1 | length 8-wire cable |
| Miscellaneous | | |
| 54-8 | 1 | Power transformer |
| 57-6 | 1 | Half wave rectifier |
| 91-1 | 1 | Cabinet |
| 100-M32 | 1 | Chart and roller assembly |
| 203-40F14 | 1 | Panel |
| 204-M43 | 2 | Roll chart bracket |
| 204-M44 | 1 | Panel lamp bracket |
| 260-3 | 1 | Grid clip |
| 407-13 | 1 | Tube checker meter |
| 451-1 | 1 | Drive gear |
| 452-1 | 1 | Drive gear pin |
| 595-63 | 1 | Manual |

# SUPPLEMENT TEST DATA SHEET

## FOR USE WITH HEATHKIT TC1, TC-2 and TC-2P TUBE CHECKERS

Lever switch settings in large type refer to continuity tests. See test procedure in manual.

| Tube | Type | Fil. | Plate | Top | Bottom |
|---|---|---|---|---|---|
| OOA | 2 | 5 | 30 | bc | D |
| O1A | 2 | 5 | 45 | bc | D |
| OA2 | 4 | .75 | 40 | AE | BDG |
| | | (Good tube reads 10) | | | |
| OA3/VR75 | 4 | .75 | 30 | e | bCG |
| | | (Good tube reads 10) | | | |
| OA4 | (1) 4 | .75 | 40 | g | be |
| | (2) 4 | .75 | 44 | e | bg |
| OB2 | 4 | .75 | 94 | AE | BDG |
| | | (Good tube reads 10) | | | |
| OB3/VR90 | 4 | .75 | 30 | e | bCG |
| | | (Good tube reads 10) | | | |
| OC3/VR105 | 4 | .75 | 30 | e | bCG |
| | | (Good tube reads 10) | | | |
| OD3/VR150 | 4 | .75 | 30 | e | bCG |
| | | (Good tube reads 10) | | | |
| OY4 | 4 | .75 | 22 | e | cgh |
| OZ4 | (1) 4 | .75 | 22 | e | ch |
| | (2) 4 | .75 | 22 | c | eh |
| 1A3 | 1 | 1.4 | 75 | BF | cG |
| 1A4 | 1 | 2 | 28 | bck | D |
| 1A6 | (1) 2 | 2 | 50 | cd | F |
| | (2) 1 | 2 | 95 | bek | F |
| 1AB5 | 1 | 1.4 | 25 | bcf | GH |
| 1B4 | 1 | 2 | 27 | bck | D |
| 1B4P(951) | 2 | 2 | 35 | bck | D |
| 1B5(25S) | (1) 1 | 2 | 31 | be | F |
| | (2) 1 | 2 | 40 | d | F |
| | (3) 1 | 2 | 40 | c | F |
| 1B7 | (1) 1 | 1.4 | 26 | ef | G |
| | (2) 1 | 1.4 | 95 | cdk | G |
| 1B8 | (1) 2 | 1.4 | 32 | cde | G |
| | (2) 2 | 1.4 | 60 | fk | G |
| | (3) 1 | 1.4 | 95 | h | G |
| 1C6 | (1) 2 | 2 | 42 | cd | F |
| | (2) 1 | 2 | 68 | bek | F |
| 1C7 | (1) 2 | 2 | 41 | ef | G |
| | (2) 1 | 2 | 56 | cdk | G |
| 1D5 | 2 | 2 | 39 | cdk | G |
| 1D5GP | 2 | 2 | 33 | cdk | G |
| 1D7 | (1) 1 | 2 | 31 | ef | G |
| | (2) 1 | 2 | 95 | cdk | G |
| 1D8 | (1) 2 | 1.4 | 48 | fk | G |
| | (2) 2 | 1.4 | 37 | cde | G |
| | (3) 1 | 1.4 | 95 | h | G |
| 1E3 | 3 | 1.4 | 30 | ah | CE |
| 1E4 | 2 | 1.4 | 45 | ce | G |
| 1E5 | 1 | 2 | 35 | cdk | G |
| 1E7 | (1) 2 | 2 | 30 | cdh | G |
| | (2) 2 | 2 | 30 | efh | G |
| 1F4 | 3 | 2 | 47 | bcd | E |

| Tube | Type | Fil. | Plate | Top | Bottom |
|---|---|---|---|---|---|
| 1F5 | 2 | 2 | 36 | cde | G |
| 1F6 | (1) 1 | 2 | 37 | bck | F |
| | (2) 1 | 2 | 95 | d | F |
| | (3) 1 | 2 | 95 | e | F |
| 1F7(GV) | (1) 1 | 2 | 35 | cfk | G |
| | (2) 1 | 2 | 95 | e | G |
| | (3) 1 | 2 | 95 | d | G |
| 1G5 | 2 | 2 | 39 | cde | G |
| 1H4 | 2 | 2 | 41 | ce | G |
| 1H6 | (1) 1 | 2 | 30 | cf | G |
| | (2) 1 | 2 | 40 | e | G |
| | (3) 1 | 2 | 40 | d | G |
| 1J5 | 2 | 2 | 38 | cde | G |
| 1J6 | (1) 2 | 2 | 39 | cd | G |
| | (2) 2 | 2 | 39 | ef | G |
| 1N6 | (1) 2 | 1.4 | 38 | cde | G |
| | (2) 1 | 1.4 | 95 | f | G |
| | | (Good - 20 on Test 2) | | | |
| 1R4(1294) | 1 | 1.4 | 57 | d | gH |
| | | (Good tube reads 10) | | | |
| 1SA6 | 2 | 1.4 | 30 | cdfh | G |
| 1SB6 | (1) 1 | 1.4 | 36 | cdh | G |
| | (2) 1 | 1.4 | 90 | e | G |
| 1V(KR-1) | 3 | 6.3 | 24 | b | cD |
| 2A3 | 3 | 2.5 | 28 | bc | D |
| 2A4 | (1) 3 | 2.5 | 25 | e | G |
| | (2) 3 | 2.5 | 25 | c | eG |
| | | (no short test) | | | |
| 2A5(KR-25) | 3 | 2.5 | 36 | bcd | eF |
| 2A6 | (1) 3 | 2.5 | 26 | bk | eF |
| | (2) 1 | 2.5 | 40 | d | eF |
| | (3) 1 | 2.5 | 40 | c | eF |
| 2A7 | (1) 2 | 2.5 | 32 | e | fG |
| | (2) 2 | 2.5 | 64 | bcdk | fG |
| 2B4 | 3 | 2.5 | 24 | bc | dE |
| 2B6 | (1) 2 | 2.5 | 95 | b | Fg |
| | (2) 3 | 2.5 | 50 | cd | eG |
| 2B7 | (1) 3 | 2.5 | 47 | bck | fG |
| | (2) 1 | 2.5 | 40 | e | fG |
| | (3) 1 | 2.5 | 40 | d | FG |
| 2C21 (1642) | (1) 2 | 6.3 | 29 | ck | bG |
| | (2) 2 | 6.3 | 29 | de | fG |
| 2C22 (7193) | 3 | 6.3 | 22 | k | Gh |
| | | (Short Top Caps Together) | | | |
| 2C26 | 3 | 6.3 | 35 | k | Gh |
| 2C51 | (1) 2 | 6.3 | 23 | cd | bfgHJ |
| | (2) 2 | 6.3 | 23 | fg | BcdhJ |
| 2C52 | (1) 2 | 12.6 | 26 | de | fG |
| | (2) 2 | 12.6 | 26 | ab | cG |
| 2D21 | 3 | 6.3 | 18 | aEfG | bD |
| 2E5 | (1) 2 | 2.5 | 44 | bc | eF |

| Tube | Type | Fil. | Plate | Top | Bottom |
|---|---|---|---|---|---|
| eye clsd. | (2) 4 | 2.5 | 0 | bd | ceF |
| eye open | (3) 4 | 2.5 | 0 | d | bceF |
| 2E22 | 3 | 6.3 | 25 | bcdk | E |
| 2E24 | 3 | 2.5 | 22 | cek | BG |
| | (in short test A, D, F should show short when moved to top position) | | | | |
| 2E25 | 3 | 6.3 | 28 | dehk | B |
| 2G5 | (1) 2 | 2.5 | 44 | bc | eF |
| eye clsd. | (2) 4 | 2.5 | 0 | bd | ceF |
| eye open | (3) 4 | 2.5 | 0 | d | bceF |
| 2S/4S | (1) 1 | 2.5 | 45 | c | dE |
| (G-2) | (2) 1 | 2.5 | 45 | b | dE |
| 2V3 | 1 | 2.5 | 96 | k | G |
| | (Good tube reads 20) | | | | |
| 2W3 | 2 | 2.5 | 36 | d | H |
| 2X3 | 3 | 2.5 | 43 | d | H |
| 2Y2 | 1 | 2.5 | 95 | k | D |
| | (Good tube reads 40) | | | | |
| 2Z2(G84) | 3 | 2.5 | 56 | b | D |
| 3A5 | (1) 2 | 1.4 | 30 | bc | D |
| | (2) 2 | 1.4 | 30 | ef | D |
| 3A8 | (1) 1 | 1.4 | 36 | cdk | BG |
| | (2) 1 | 1.4 | 36 | ef | BG |
| | (3) 1 | 1.4 | 45 | h | BG |
| 3B4 | 3 | 1.4 | 47 | acg | E |
| 3B5 | 2 | 1.4 | 35 | cde | BG |
| 3B7(1291) | (1) 1 | 1.4 | 33 | bc | AH |
| | (2) 1 | 1.4 | 33 | fg | AH |
| 3C4 | 1 | 1.4 | 23 | bcf | E |
| 3C5 | 2 | 1.4 | 34 | cde | BG |
| 3C6 (XXB) | (1) 2 | 1.4 | 40 | cd | AH |
| | (2) 2 | 1.4 | 40 | ef | AH |
| 3D6 (1299) | 2 | 1.4 | 30 | bcf | AH |
| 3E5 | 2 | 1.4 | 31 | bcf | AG |
| 3E6 | 2 | 1.4 | 30 | bcdf | AH |
| 4A6 | (1) 2 | 2 | 35 | cd | H |
| | (2) 3 | 2 | 46 | ef | H |
| 5T4 | (1) 3 | 5 | 26 | f | H |
| | (2) 3 | 5 | 26 | d | H |
| 5X3 | (1) 3 | 5 | 43 | b | D |
| | (2) 3 | 5 | 43 | c | D |
| 6A3 | 3 | 6.3 | 28 | bc | D |
| 6A4/LA(KR5) | 3 | 6.3 | 36 | bcd | E |
| 6A5 | 2 | 2.5 | 28 | ce | BG |
| 6A6 | (1) 3 | 6.3 | 36 | bc | DG |
| | (2) 3 | 6.3 | 36 | ef | DG |
| 6A7 | (1) 2 | 6.3 | 30 | de | fG |
| | (2) 2 | 6.3 | 38 | bck | fG |
| 6AB5 | (1) 2 | 6.3 | 36 | bc | eF |
| eye clsd. | (2) 4 | 6.3 | 0 | bd | ceF |
| eye open | (3) 4 | 6.3 | 0 | d | bceF |
| 6AB6 | (1) 3 | 6.3 | 62 | de | cGh |
| | (2) 3 | 6.3 | 44 | ce | dGh |
| 6AB7(1853) | 3 | 6.3 | 23 | dfh | ceG |
| 6AC6 | 2 | 6.3 | 26 | cde | Gh |
| 6AD6 | (1) 4 | 6.3 | 95 | cde | Gh |
| | (Good tube reads 26) | | | | |
| eye clsd. | (2) 4 | 6.3 | 0 | cde | Gh |
| eye open | (3) 4 | 6.3 | 0 | e | cdGh |
| 6AD7 | (1) 3 | 6.3 | 33 | cde | Gh |
| | (2) 2 | 6.3 | 51 | af | Gh |
| 6AE5 | 3 | 6.3 | 29 | ce | Gh |
| 6AE6 | (1) 2 | 6.3 | 33 | ce | Gh |
| | (2) 2 | 6.3 | 33 | de | Gh |
| 6AE7 | (1) 2 | 6.3 | 26 | cd | eG |
| | (2) 2 | 6.3 | 27 | cf | Gh |
| 6AF5 | 2 | 6.3 | 24 | ce | Gh |
| 6AF6 | (1) 4 | 6.3 | 95 | cde | Gh |
| | (Good tube reads 26) | | | | |
| eye clsd. | (2) 4 | 6.3 | 0 | cde | Gh |
| eye open | (3) 4 | 6.3 | 0 | e | cdGh |
| 6AH7 | (1) 3 | 6.3 | 30 | ac | bG |
| | (2) 3 | 6.3 | 30 | ef | dG |
| 6AL6 | 3 | 6.3 | 24 | dek | Gh |
| 6AQ7 | (1) 1 | 6.3 | 22 | de | fH |
| | (2) 1 | 6.3 | 34 | c | bH |
| | (3) 1 | 6.3 | 34 | a | bH |
| 6AX6G | (1) 1 | 6.3 | 19 | e | Gh |
| | (2) 1 | 6.3 | 19 | c | dG |
| 6B5 | (1) 3 | 6.3 | 45 | bd | ceF |
| | (2) 3 | 6.3 | 63 | cd | beF |
| 6B6 | (1) 3 | 6.3 | 32 | ck | Gh |
| | (2) 1 | 6.3 | 40 | d | Gh |
| | (3) 1 | 6.3 | 40 | e | Gh |
| 6B7 | (1) 3 | 6.3 | 50 | bck | fG |
| | (2) 1 | 6.3 | 40 | d | fG |
| | (3) 1 | 6.3 | 40 | e | fG |
| 6B8 | (1) 3 | 6.3 | 45 | cfk | Gh |
| | (2) 1 | 6.3 | 40 | d | Gh |
| | (3) 1 | 6.3 | 40 | e | Gh |
| 6C6 | 1 | 6.3 | 21 | bck | deF |
| 6C7 | (1) 1 | 6.3 | 21 | bk | fG |
| | (2) 1 | 6.3 | 40 | d | fG |
| | (3) 1 | 6.3 | 40 | e | fG |
| 6C8 | (1) 2 | 6.3 | 27 | ck | dG |
| | (2) 2 | 6.3 | 27 | ef | Gh |
| 6D5 | 3 | 6.3 | 32 | ce | Gh |
| 6D6 | 3 | 6.3 | 27 | bcdk | eF |
| 6D7 | 2 | 6.3 | 28 | bck | dfG |
| 6D8 | (1) 2 | 6.3 | 34 | ef | Gh |
| | (2) 2 | 6.3 | 42 | cdk | Gh |
| 6E5 | (1) 2 | 6.3 | 36 | bc | eF |
| eye open | (2) 4 | 6.3 | 0 | d | bceF |
| eye clsd. | (3) 4 | 6.3 | 0 | bd | ceF |
| 6E6 | (1) 3 | 6.3 | 31 | bc | DG |
| | (2) 3 | 6.3 | 31 | ef | DG |
| 6E7 | 2 | 6.3 | 28 | bck | DfG |
| 6F7 | (1) 3 | 6.3 | 43 | bck | fG |
| | (2) 3 | 6.3 | 82 | de | fG |
| 6F8 | (1) 2 | 6.3 | 24 | ck | dG |
| | (2) 2 | 6.3 | 24 | ef | Gh |
| 6G5(6U5) | (1) 2 | 6.3 | 36 | bc | eF |

| Tube | Type | Fil. | Plate | Top | Bottom |
|---|---|---|---|---|---|
| eye clsd. | (2) 4 | 6.3 | 0 | bd | ceF |
| eye open | (3) 4 | 6.3 | 0 | d | bceF |
| 6G6 | 3 | 6.3 | 36 | cde | Gh |
| 6G6G | 2 | 6.3 | 28 | cde | Bh |
| 6G7 | (1) 3 | 6.3 | 36 | bk | Ceg |
| | (2) 1 | 6.3 | 24 | d | CG |
| | (3) 1 | 6.3 | 24 | f | CG |
| 6H4 | 1 | 6.3 | 26 | d | Gh |
| 6H5 | (1) 2 | 6.3 | 36 | bc | eF |
| eye clsd. | (2) 4 | 6.3 | 0 | bd | ceF |
| eye open | (3) 4 | 6.3 | 0 | d | bceF |
| 6J4 | 2 | 6.3 | 20 | AEFg | bD |
| 6M8 | (1) 2 | 6.3 | 26 | cdk | aG |
| | (2) 2 | 6.3 | 26 | ef | aG |
| | (3) 1 | 6.3 | 34 | h | aG |
| 6N4 | 2 | 6.3 | 24 | AeG | BDF |
| 6N6 | (1) 3 | 6.3 | 61 | de | cGh |
| | (2) 3 | 6.3 | 41 | ce | dGh |
| 6N8 | (1) 1 | 6.3 | 22 | abf | cD |
| | (2) 1 | 6.3 | 45 | g | cD |
| | (3) 1 | 6.3 | 45 | h | cD |
| 6P7 | (1) 2 | 6.3 | 32 | dek | Bh |
| | (2) 3 | 6.3 | 70 | fg | Bh |
| 6Q4 | 2 | 6.3 | 21 | ABGHj | cD |
| 6Q6 | (1) 1 | 6.3 | 20 | ck | Gh |
| | (2) 1 | 6.3 | 90 | e | Gh |
| 6R6 | 3 | 6.3 | 41 | cek | Gh |
| 6S6 | 3 | 6.3 | 24 | adk | Gh |
| 6S8 | (1) 1 | 6.3 | 28 | fk | bG |
| | (2) 1 | 6.3 | 40 | a | bG |
| | (3) 1 | 6.3 | 40 | d | bG |
| | (4) 1 | 6.3 | 40 | c | eG |
| 6SB7Y | (1) 2 | 6.3 | 22 | de | afG |
| | (2) 1 | 6.3 | 34 | cdh | efG |
| 6SE7 | 2 | 6.3 | 23 | dfh | ceG |
| 6SV7 | (1) 2 | 6.3 | 23 | bdf | cH |
| | (2) 2 | 6.3 | 28 | e | cH |
| 6SZ7 | (1) 1 | 6.3 | 50 | e | cH |
| | (2) 1 | 6.3 | 50 | d | cH |
| | (3) 1 | 6.3 | 21 | bf | cH |
| 6T5 | (1) 1 | 6.3 | 24 | bc | eF |
| eye clsd. | (2) 4 | 6.3 | 0 | bd | ceF |
| eye open | (3) 4 | 6.3 | 0 | d | bceF |
| 6T7 | (1) 1 | 6.3 | 20 | ck | Gh |
| | (2) 1 | 6.3 | 40 | d | Gh |
| | (3) 1 | 6.3 | 40 | e | Gh |
| 6U3 | 3 | 6.3 | 17 | j | cD |
| 6U4 | 3 | 6.3 | 18 | e | cG |
| 6U6 | 3 | 6.3 | 24 | cde | Gh |
| 6V4 | (1) 3 | 6.3 | 26 | b | dE |
| | (2) 3 | 6.3 | 26 | c | dE |
| 6V7 | (1) 3 | 6.3 | 46 | k | Gh |
| | (2) 1 | 6.3 | 50 | d | Gh |
| | (3) 1 | 6.3 | 50 | e | Gh |
| 6W5 | (1) 3 | 6.3 | 25 | c | Gh |
| | (2) 3 | 6.3 | 25 | e | Gh |
| 6W7 | 1 | 6.3 | 20 | cdk | eGh |
| 6X6 | (1) 2 | 6.3 | 41 | e | Gh |
| eye clsd. | (2) 4 | 6.3 | 0 | cd | eGh |
| eye open | (3) 4 | 6.3 | 0 | d | ceGh |
| 6Y3G | 4 | 6.3 | 47 | k | G |
| 6Y5 | (1) 3 | 6.3 | 28 | c | dF |
| | (2) 3 | 6.3 | 28 | e | dF |
| 6Y7 | (1) 3 | 6.3 | 33 | cd | Gh |
| | (2) 3 | 6.3 | 33 | ef | Gh |
| 6Z3 | 3 | 6.3 | 24 | b | cD |
| 6Z4(84) | (1) 3 | 6.3 | 26 | b | dE |
| (KR98) | (2) 3 | 6.3 | 26 | c | dE |
| 6Z5(12Z5) | (1) 3 | 6.3 | 25 | c | BdF |
| | (2) 3 | 6.3 | 25 | e | BdF |
| 6Z7 | (1) 3 | 6.3 | 32 | cd | Gh |
| | (2) 3 | 6.3 | 32 | ef | Gh |
| 6ZY5 | (1) 3 | 6.3 | 36 | c | Gh |
| | (2) 3 | 6.3 | 36 | e | Gh |
| 7A4 (XXL) | 2 | 6.3 | 24 | bf | gH |
| 7A5 | 3 | 6.3 | 23 | bcf | gH |
| 7A6 | (1) 1 | 6.3 | 28 | c | bH |
| | (2) 1 | 6.3 | 28 | f | gH |
| 7A7 | 3 | 6.3 | 28 | bcf | dgH |
| 7A8 | (1) 2 | 6.3 | 35 | cd | gH |
| | (2) 2 | 6.3 | 44 | bef | gH |
| 7AB7 | 3 | 6.3 | 26 | ace | DFGH |
| 7AJ7 | 2 | 6.3 | 23 | bcf | dgH |
| 7B4 | 1 | 6.3 | 22 | bf | gH |
| 7B5 | 3 | 6.3 | 29 | bcf | gH |
| 7B6 | (1) 2 | 6.3 | 25 | bc | DGH |
| | (2) 1 | 6.3 | 58 | e | DGH |
| | (3) 1 | 6.3 | 58 | f | DGH |
| 7B7 | 2 | 6.3 | 28 | bcf | dgH |
| 7B8 | (1) 2 | 6.3 | 28 | cd | gH |
| | (2) 2 | 6.3 | 34 | bef | gH |
| 7C5 | 3 | 6.3 | 29 | bcf | gH |
| 7C6 | (1) 3 | 6.3 | 33 | bc | DGH |
| | (2) 1 | 6.3 | 40 | e | DGH |
| | (3) 1 | 6.3 | 40 | f | DGH |
| 7C7 | 1 | 6.3 | 22 | bcf | dgH |
| 7E6 | (1) 2 | 6.3 | 27 | bc | DGH |
| | (2) 1 | 6.3 | 45 | e | DGH |
| | (3) 1 | 6.3 | 45 | f | DGH |
| 7E7 | (1) 3 | 6.3 | 36 | bef | gH |
| | (2) 1 | 6.3 | 40 | c | gH |
| | (3) 1 | 6.3 | 46 | d | gH |
| 7F7 | (1) 1 | 6.3 | 20 | cd | bH |
| | (2) 1 | 6.3 | 20 | ef | gH |
| 7F8 | (1) 2 | 6.3 | 22 | ac | dG |
| | (2) 2 | 6.3 | 22 | fh | eG |
| 7G7(1232) | 2 | 6.3 | 22 | bcdf | gH |
| 7G8 | (1) 2 | 6.3 | 24 | bcd | efgH |
| | (2) 2 | 6.3 | 24 | ceg | bdfH |
| 7J7 | (1) 2 | 6.3 | 30 | cde | gH |
| | (2) 2 | 6.3 | 30 | bef | gH |
| 7K7 | (1) 1 | 6.3 | 20 | cd | bH |

| Tube | Type | Fil. | Plate | Top | Bottom |
|---|---|---|---|---|---|
| | (2) 1 | 6.3 | 39 | e | gH |
| | (3) 1 | 6.3 | 39 | f | gH |
| 7L7 | 2 | 6.3 | 26 | bcf | dgH |
| 7N7 | (1) 2 | 6.3 | 26 | cd | bH |
| | (2) 2 | 6.3 | 26 | ef | gH |
| 7Q7 | (1) 2 | 6.3 | 25 | cd | gH |
| | (2) 2 | 6.3 | 41 | bef | gH |
| 7S7 | (1) 2 | 6.3 | 33 | cd | gH |
| | (2) 2 | 6.3 | 23 | bef | gH |
| 7W7 | 2 | 6.3 | 24 | bcf | DeGH |
| 7X6 | (1) 3 | 6.3 | 20 | c | bH |
| | (2) 3 | 6.3 | 20 | f | gH |
| 7X7 | (1) 1 | 6.3 | 21 | bc | dGH |
| | (2) 1 | 6.3 | 20 | e | dGH |
| | (3) 1 | 6.3 | 21 | f | DgH |
| 7Y4 | (1) 3 | 6.3 | 33 | c | gH |
| | (2) 3 | 6.3 | 33 | f | gH |
| 7Z4 | (1) 3 | 6.3 | 34 | c | gH |
| | (2) 3 | 6.3 | 34 | f | gH |
| 10 | 3 | 7.5 | 56 | bc | D |
| 10Y | 3 | 7.5 | 42 | bc | D |
| 12A | 2 | 5 | 26 | bc | D |
| 12A5 | 3 | 6.3 | 32 | bcd | eF |
| 12A7 | (1) 2 | 12.6 | 29 | bck | fG |
| | (2) 1 | 12.6 | 20 | e | dG |
| 12AH7 | (1) 3 | 12.6 | 30 | ac | bG |
| | (2) 3 | 12.6 | 30 | ef | dG |
| 12B6 | (1) 3 | 12.6 | 31 | ck | Gh |
| | (2) 1 | 12.6 | 58 | d | Gh |
| | (3) 1 | 12.6 | 58 | e | Gh |
| 12B8 | (1) 2 | 12.6 | 26 | cdk | aG |
| | (2) 3 | 12.6 | 26 | eh | fG |
| 12L8G | (1) 3 | 12.6 | 20 | cde | bG |
| | (2) 3 | 12.6 | 22 | aeh | bG |
| 12SW7 | (1) 2 | 12.6 | 26 | bf | cG |
| | (2) 1 | 12.6 | 43 | d | cG |
| | (3) 1 | 12.6 | 43 | e | cG |
| 12SX7 | (1) 2 | 12.6 | 25 | de | fH |
| | (2) 2 | 12.6 | 25 | ab | cH |
| 12SY7 | (1) 2 | 12.6 | 32 | ach | fG |
| | (2) 2 | 12.6 | 26 | de | fG |
| 12Z3 | 3 | 12.6 | 25 | b | cD |
| 14 | 2 | 12.6 | 30 | bck | dE |
| 14A4 | 2 | 12.6 | 26 | bf | gH |
| 14A5 | 3 | 12.6 | 33 | bcf | gH |
| 14A7(12B7) | 2 | 12.6 | 30 | bcdf | gH |
| 14AF7 | (1) 3 | 12.6 | 25 | ef | BcdgH |
| (XXD) | (2) 3 | 12.6 | 25 | cd | befGH |
| 14B6 | (1) 1 | 12.6 | 20 | bc | DGH |
| | (2) 1 | 12.6 | 40 | e | DGH |
| | (3) 1 | 12.6 | 40 | f | DGH |
| 14B8 | (1) 2 | 12.6 | 34 | cd | gH |
| | (2) 2 | 12.6 | 30 | bef | gH |
| 14C5 | 3 | 12.6 | 25 | bcf | gH |
| 14C7 | 2 | 12.6 | 28 | bcf | dgH |
| 14E6 | (1) 3 | 12.6 | 31 | bc | DGH |
| | (2) 1 | 12.6 | 65 | e | DGH |
| | (3) 1 | 12.6 | 65 | f | DGH |
| 14E7 | (1) 2 | 12.6 | 28 | bef | gH |
| | (2) 1 | 12.6 | 58 | c | gH |
| | (3) 1 | 12.6 | 58 | d | gH |
| 14F7 | (1) 1 | 12.6 | 20 | cd | bH |
| | (2) 1 | 12.6 | 20 | ef | gH |
| 14F8 | (1) 3 | 12.6 | 22 | ac | dG |
| | (2) 3 | 12.6 | 22 | fh | eG |
| 14J7 | (1) 2 | 12.6 | 32 | cde | fgH |
| | (2) 3 | 12.6 | 33 | bef | gH |
| 14N7 | (1) 2 | 12.6 | 26 | cd | bH |
| | (2) 2 | 12.6 | 26 | ef | gH |
| 14Q7 | (1) 2 | 12.6 | 25 | cd | gH |
| | (2) 2 | 12.6 | 30 | bef | gH |
| 14R7 | (1) 1 | 12.6 | 18 | bef | gH |
| | (2) 1 | 12.6 | 50 | c | gH |
| | (3) 1 | 12.6 | 50 | d | gH |
| 14S7 | (1) 2 | 12.6 | 28 | cd | gH |
| | (2) 2 | 12.6 | 24 | bef | gH |
| 14V7 | 3 | 12.6 | 18 | bcf | dgH |
| 14W7 | 2 | 12.6 | 22 | bcf | DeGH |
| 14X7 | (1) 1 | 12.6 | 20 | bc | dgH |
| | (2) 1 | 12.6 | 20 | e | dgH |
| | (3) 2 | 12.6 | 24 | f | dgH |
| | | (Good tube reads 30) | | | |
| 14Y4 | (1) 3 | 12.6 | 28 | c | gH |
| | (2) 3 | 12.6 | 28 | f | gH |
| 14Z3 | 3 | 12.6 | 25 | b | cD |
| 15 | 2 | 2 | 36 | bck | dE |
| 15A6(PL83) | 1 | 12.6 | 20 | abfg | cE |
| 16A5 | 3 | 12.6 | 18 | bgj | cD |
| 17 | 3 | 12.6 | 40 | bc | dE |
| 17Z3 | 4 | 12.6 | 18 | BJ | Dk |
| 18 | 3 | 12.6 | 31 | bcd | eF |
| 19 | (1) 3 | 2 | 37 | bc | F |
| | (2) 3 | 2 | 39 | de | F |
| 20 | 2 | 6.3 | 48 | bc | D |
| 22 | 1 | 2.5 | 56 | bck | D |
| 24A | 2 | 2.5 | 32 | bck | dE |
| 25A6 | 3 | 25 | 27 | cde | Gh |
| 25A7 | (1) 3 | 25 | 27 | cde | Gh |
| | (2) 3 | 25 | 23 | f | aG |
| 25AC5 | 3 | 25 | 31 | ce | Gh |
| 25B5 | (1) 3 | 25 | 37 | bd | eF |
| | (2) 3 | 25 | 46 | cd | beF |
| 25B6 | 3 | 25 | 23 | cde | Gh |
| 25B8 | (1) 2 | 25 | 25 | cdk | aG |
| | (2) 2 | 25 | 25 | eh | fG |
| 25D8 | (1) 2 | 25 | 26 | ef | aG |
| | (2) 2 | 25 | 26 | cdk | aG |
| | (3) 1 | 25 | 22 | h | aG |
| 25N6 | 2 | 25 | 30 | cde | Gh |
| 25X6 | (1) 3 | 25 | 27 | c | dG |
| | (2) 3 | 25 | 27 | e | Gh |
| 25Y4 | 3 | 25 | 25 | e | Gh |

| Tube | Type | Fil. | Plate | Top | Bottom |
|---|---|---|---|---|---|
| 25Y5 | (1) 3 | 25 | 30 | b | cF |
| | (2) 3 | 25 | 30 | e | dF |
| 26 | 2 | 1.4 | 38 | bc | D |
| 26A6 | 2 | 25 | 22 | abef | Dg |
| 26A7 | (1) 2 | 25 | 20 | cde | bG |
| | (2) 2 | 25 | 20 | aeh | bG |
| 26C6 | (1) 3 | 25 | 30 | ag | bDef |
| | (2) 1 | 25 | 36 | e | abDfg |
| | (3) 1 | 25 | 36 | f | abDeg |
| 26D6 | (1) 2 | 25 | 22 | af | bCeg |
| | (2) 1 | 25 | 40 | efg | abC |
| 27 | 2 | 2.5 | 32 | bc | dE |
| 28Z5 | (1) 3 | 12.6 | 38 | c | AgH |
| | (2) 3 | 12.6 | 38 | f | Dg |
| 29 | 2 | 2.5 | 36 | bc | deF |
| 30 | 2 | 2 | 35 | bc | D |
| 31 | 2 | 2 | 40 | bc | D |
| 32 | 2 | 2 | 42 | bck | D |
| 32L7 | (1) 3 | 32 | 21 | cde | Gh |
| | (2) 3 | 32 | 18 | f | aG |
| 33 | 3 | 2 | 39 | bcd | E |
| 34 | 2 | 2 | 40 | bck | D |
| 35(51) | 2 | 2.5 | 30 | bck | dE |
| 35A5 | 3 | 32 | 22 | bcf | gH |
| 35Z3 | 3 | 32 | 22 | b | gH |
| 35Z6 | (1) 3 | 32 | 20 | c | dG |
| | (2) 3 | 32 | 20 | e | Gh |
| 36 | 2 | 6.3 | 32 | bck | dE |
| 37 | 3 | 6.3 | 37 | bc | dE |
| 38 | 3 | 6.3 | 36 | bck | dE |
| 39(44) | 2 | 6.3 | 30 | bck | dE |
| 40 | 1 | 5 | 28 | bc | D |
| 40Z5(45Z5) | 3 | 32 | 20 | e | BCh |
| 41 | 3 | 6.3 | 32 | bcd | eF |
| 42 | 3 | 6.3 | 29 | bcd | eF |
| 43 | 3 | 25 | 31 | bcd | eF |
| 45 | 3 | 2.5 | 32 | bc | D |
| 46 | 3 | 2.5 | 35 | bcd | E |
| 47 | 3 | 2.5 | 41 | bcd | E |
| 48 | 3 | 32 | 25 | bcd | eF |
| 49 | 2 | 2 | 38 | bcd | E |
| 50(585) | 3 | 7.5 | 42 | bc | D |
| 50Z7 | (1) 3 | 50 | 25 | c | dFG |
| | (2) 3 | 50 | 25 | e | FGh |
| 52 | 3 | 6.3 | 30 | bcd | E |
| 53 | (1) 3 | 2.5 | 32 | bc | dG |
| | (2) 3 | 2.5 | 32 | ef | dG |
| 55 | (1) 2 | 2.5 | 32 | bk | eF |
| | (2) 1 | 2.5 | 40 | c | eF |
| | (3) 1 | 2.5 | 40 | d | eF |
| 56 | 2 | 2.5 | 30 | bc | dE |
| 57 | 2 | 2.5 | 30 | bck | deF |
| 57A(AS) | 3 | 6.3 | 34 | bck | deF |
| 58 | 3 | 2.5 | 35 | bck | deF |
| 58AS | 3 | 6.3 | 35 | bck | deF |
| 59 | 3 | 2.5 | 29 | bcde | fG |

| Tube | Type | Fil. | Plate | Top | Bottom |
|---|---|---|---|---|---|
| 64 | 1 | 6.3 | 22 | bck | dE |
| 65 | 2 | 6.3 | 28 | bck | dE |
| 67 | 3 | 6.3 | 37 | bc | dE |
| 68 | 3 | 6.3 | 37 | bck | dE |
| 70A7 | (1) 3 | 70 | 23 | cde | FGh |
| | (shows short on "A") | | | | |
| | (2) 3 | 70 | 20 | | aFG |
| | (Allow tube to heat up, return levers "F" and "G" to UP position. Good tube will kick to 70.) | | | | |
| 71A | 3 | 5 | 47 | bc | D |
| 72 | 4 | 2.5 | 35 | k | D |
| 75 | (1) 1 | 6.3 | 20 | bk | eF |
| | (2) 1 | 6.3 | 38 | c | eF |
| | (3) 1 | 6.3 | 38 | d | eF |
| 76 | 2 | 6.3 | 33 | bc | dE |
| 77 | 2 | 6.3 | 30 | bck | deF |
| 78 | 3 | 6.3 | 31 | bck | deF |
| 79 | (1) 3 | 6.3 | 30 | bc | dF |
| | (2) 3 | 6.3 | 30 | ek | dF |
| 80 | (1) 3 | 5 | 55 | b | D |
| | (2) 3 | 5 | 55 | c | D |
| 81 | 3 | 7.5 | 75 | b | D |
| 82(82V) | (1) 3 | 2.5 | 24 | b | D |
| | (2) 3 | 2.5 | 24 | c | D |
| 83(83V) | (1) 3 | 5 | 26 | b | D |
| | (2) 3 | 5 | 26 | c | D |
| 85 | (1) 3 | 6.3 | 45 | bk | eF |
| | (2) 1 | 6.3 | 47 | c | eF |
| | (3) 1 | 6.3 | 47 | d | eF |
| 86M | 3 | 6.3 | 37 | ce | Gh |
| 87S | 2 | 6.3 | 33 | bck | deF |
| 88 | (1) 3 | 5 | 26 | b | D |
| | (2) 3 | 5 | 26 | c | D |
| 88M | 3 | 6.3 | 31 | cdk | eGh |
| 88S | 3 | 6.3 | 32 | bck | deF |
| 89 | 3 | 6.3 | 32 | bck | eF |
| 89RS | (1) 3 | 6.3 | 36 | bk | CeG |
| | (2) 1 | 6.3 | 24 | d | cG |
| | (3) 1 | 6.3 | 24 | f | cG |
| 95 | 3 | 2.5 | 36 | bcd | eF |
| 98 | (1) 3 | 6.3 | 26 | b | dE |
| | (2) 3 | 6.3 | 26 | c | dE |
| 99(99XX99) | 2 | 2.5 | 65 | bc | D |
| 99V(V99) | 2 | 2.5 | 65 | ac | D |
| 113HY(123HY) | 1 | 1.4 | 45 | bc | E |
| 114HY | 3 | 1.4 | 55 | k | G |
| | (short top caps together) | | | | |
| 115HY(145HY) | 1 | 1.4 | 45 | bcd | E |
| 117N7 | (1) 3 | 110 | 20 | cde | fGh |
| | (2) 3 | 110 | 15 | | Gh |
| | (Allow tube to heat up. Return lever G to top position. Good tube will kick to 70.) | | | | |
| 117P7 | (1) 3 | 110 | 22 | cde | fGh |
| | (2) 3 | 110 | 15 | | Gh |

| Tube | Type | Fil. | Plate | Top | Bottom |
|---|---|---|---|---|---|
| | (Allow tube to heat up. Return lever G to UP position. Good tube will kick to 70.) | | | | |
| 117Z4 | 3 | 110 | 19 | e | Gh |
| 128A/2523N1 | 4 | 2.5 | 20 | bc | dE |
| 182-B(482-B) | 3 | 5 | 37 | bc | D |
| 183(483) | 3 | 5 | 40 | bc | D |
| 201B | 2 | 5 | 45 | bc | D |
| 201C | 2 | 5 | 45 | bc | D |
| 210T | 3 | 7.5 | 56 | bc | D |
| 230S | 2 | 2 | 35 | bc | D |
| 233S | 3 | 2 | 39 | bcd | E |
| 234S | 2 | 2 | 40 | bck | D |
| 257A | 2 | 2.5 | 41 | bk | D |
| 262B | 3 | 7.5 | 42 | bk | cD |
| 274A | (1) 3 | 5 | 36 | b | D |
| | (2) 3 | 5 | 36 | c | D |
| 300B | 3 | 5 | 21 | bc | d |
| 310B | 2 | 7.5 | 28 | bcd | Ae |
| 313C | 4 | .75 | 45 | b | A |
| 313CB | 4 | .75 | 53 | b | ad |
| 313CD | 4 | .75 | 44 | b | ad |
| 348A | 1 | 6.3 | 24 | cdek | Bh |
| 376B | 4 | .75 | 37 | e | bg |
| 393A | 4 | 2.5 | 20 | dk | AB |
| 427 | 3 | 2.5 | 44 | bc | dE |
| 482A | 3 | 5 | 47 | bc | D |
| 484(485) | 3 | 2.5 | 32 | bc | dE |
| 486 | 2 | 2.5 | 48 | bc | dE |
| 501X | 1 | 1.4 | 35 | cde | G |
| 502A(GL502A) | 3 | 6.3 | 19 | cef | gH |
| 502X | 1 | 1.4 | 35 | cde | G |
| 503X | 1 | 1.4 | 35 | cde | G |
| 504X | 1 | 1.4 | 35 | cde | G |
| 520AX | 1 | 1.4 | 30 | abd | E |
| 521AX | 1 | 1.4 | 30 | abd | E |
| 567 | (1) 3 | 5 | 24 | d | H |
| | (2) 3 | 5 | 24 | f | H |
| 586 | 3 | 7.5 | 42 | bc | D |
| 605CX | 2 | 6.3 | 22 | abeg | Df |
| 606BX | 2 | 6.3 | 23 | a | Cd |
| 608CX | 3 | 6.3 | 20 | ae | Df |
| 615HY | 3 | 6.3 | 33 | k | G |
| | | (short top caps together) | | | |
| 619CX | 2 | 6.3 | 25 | ad | Ce |
| 713A | 2 | 6.3 | 25 | dfh | CEG |
| 717A | 1 | 6.3 | 23 | dfh | CEG |
| Z729 | 1 | 6.3 | 20 | afhj | BcEG |
| 800 | 3 | 7.5 | 54 | k | D |
| | | (short top caps together) | | | |
| 801 | 3 | 7.5 | 42 | bc | D |
| 802 | 3 | 6.3 | 29 | cdk | efG |
| 807 | 3 | 6.3 | 25 | bck | dE |
| 809 | 3 | 6.3 | 27 | ck | D |
| 812 | 3 | 6.3 | 29 | ck | D |

| Tube | Type | Fil. | Plate | Top | Bottom |
|---|---|---|---|---|---|
| 816 | 4 | 2.5 | 19 | k | A |
| 837 | 3 | 12.6 | 25 | cdk | efG |
| 840 | 2 | 2 | 33 | bck | dE |
| 841 | 3 | 7.5 | 45 | bc | D |
| 842 | 3 | 7.5 | 54 | bc | D |
| 864 | 1 | 1.4 | 55 | bc | dE |
| 865 | 3 | 7.5 | 80 | bck | D |
| 866(A) | 3 | 2.5 | 25 | k | D |
| GL874 | 4 | .75 | 30 | c | aBD |
| | | (Good tube reads 10) | | | |
| 884(6Q5) | 4 | 6.3 | 20 | ce | Gh |
| 885 | 4 | 2.5 | 20 | bc | dE |
| 950 | 3 | 2 | 46 | bcd | E |
| 986 | (1) 3 | 5 | 26 | b | D |
| | (2) 3 | 5 | 26 | c | D |
| FM1000 | (1) 1 | 6.3 | 20 | be | Acg |
| | (2) 1 | 6.3 | 35 | df | Acg |
| 1003 | (1) 4 | .75 | 22 | e | ch |
| | (2) 4 | .75 | 32 | c | eh |
| 1005/CK1005 | (1) 4 | 6.3 | 26 | e | F |
| | (2) 4 | 6.3 | 26 | c | F |
| 1006/CK1006 | (1) 4 | 1.4 | 22 | c | A |
| | (2) 4 | 1.4 | 25 | b | A |
| CK1007 | (1) 4 | .75 | 21 | c | G |
| | (2) 4 | .75 | 21 | e | G |
| CK1027 | 4 | .75 | 27 | dk | ABFG |
| 1203 | 1 | 6.3 | 33 | d | gH |
| 1204 | 2 | 6.3 | 26 | ace | DFGH |
| 1221 | 1 | 6.3 | 22 | bck | deF |
| 1223 | 1 | 6.3 | 22 | cdk | eGh |
| 1229 | 1 | 2 | 25 | bck | D |
| 1231 | 2 | 6.3 | 23 | bcf | dgH |
| 1232 | 2 | 6.3 | 22 | bcdf | gH |
| 1266 | 4 | .75 | 95 | e | bcg |
| | (Good tube reads 10. No open element on levers C and G. Tube normally shows short in short position.) | | | | |
| 1267 | 4 | .75 | 31 | e | BG |
| HY1269 | 4 | 6.3 | 19 | bck | AE |
| 1273 | 3 | 6.3 | 26 | bcf | dgH |
| 1274 | (1) 4 | 6.3 | 19 | c | Gh |
| | (2) 4 | 6.3 | 19 | e | Gh |
| 1275 | (1) 3 | 5 | 30 | b | cD |
| | (2) 3 | 5 | 30 | c | bD |
| 1280 | 3 | 12.6 | 26 | bcf | dgH |
| 1284 | 3 | 12.6 | 25 | bcf | dgH |
| 1293 | 2 | 1.4 | 32 | bf | H |
| 1603 | 1 | 6.3 | 23 | bck | deF |
| 1608 | 3 | 2.5 | 24 | bc | D |
| 1609 | 2 | 1.4 | 32 | bcd | E |
| 1610 | 3 | 2.5 | 28 | bcd | E |
| 1612 | 3 | 6.3 | 25 | dk | Gh |
| 1614 | 3 | 6.3 | 24 | cde | Gh |
| 1616 | 3 | 2.5 | 57 | k | D |
| 1619 | 3 | 2.5 | 29 | cde | Gh |

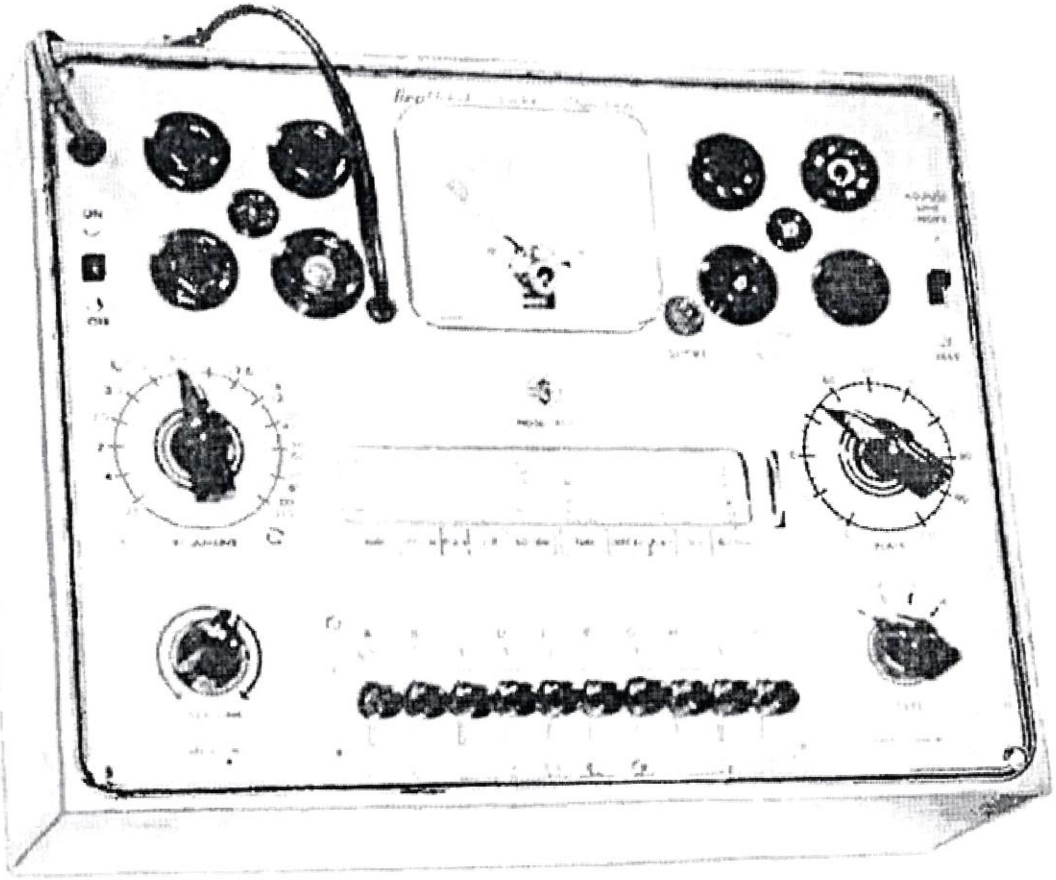
| Tube | Type | Fil. | Plate | Top | Bottom |
|---|---|---|---|---|---|
| 1620 | 1 | 6.3 | 22 | cdk | Gh |
| 1621 | 3 | 6.3 | 40 | cde | Gh |
| 1622 | 3 | 6.3 | 27 | cde | Gh |
| 1624 | 3 | 2.5 | 26 | bck | E |
| 1625 | 3 | 12.6 | 25 | cdk | fG |
| 1626 | 3 | 12.6 | 32 | ce | Gh |
| 1629 | (1)2 | 12.6 | 36 | ce | Gh |
| Eye CL | (2)4 | 12.6 | 0 | cd | eGh |
| Eye OP | (3)4 | 12.6 | 0 | d | ceGh |
| 1631 | 3 | 12.6 | 27 | cde | Gh |
| 1632 | 3 | 12.6 | 22 | cde | Gh |
| 1633 | 2 | 25 | 28 | ab | cG |
| 1634 | 1 | 12.6 | 20 | bc | fG |
| 1635 | (1)2 | 6.3 | 26 | cd | efGh |
|  | (2)2 | 6.3 | 26 | ef | cdGh |
| 1654 | 1 | 1.4 | 41 | k | A |
| 1851 | 3 | 6.3 | 20 | cdk | eGh |
| 2050/2051 | 3 | 6.3 | 17 | cef | Gh |
| 5516 | 3 | 2.5 | 25 | cek | BG |
| CK5608A | (1)2 | 2.5 | 26 | bc | dG |
|  | (2)2 | 2.5 | 26 | ef | dG |
| GL5610 | 2 | 6.3 | 22 | AEf | bD |
| 5618 | 3 | 2.5 | 21 | bcdf | AG |
| 5651 | 4 | .75 | 95 | AE | BDG |
|  |  | (Good tube reads 30) |  |  |  |
| 5654 | 2 | 6.3 | 22 | aef | BCG |
| 5659 | 3 | 12.6 | 32 | cde | Gh |
| 5660 | (1)3 | 12.6 | 41 | cfk | Gh |
|  | (2)1 | 12.6 | 38 | d | Gh |
|  | (3)1 | 12.6 | 38 | e | Gh |
| 5662 | 3 | 6.3 | 23 | ag | BDE |
|  | (Short check B and E only with filament in .75 position) |  |  |  |  |
| GL5663 | 2 | 6.3 | 32 | aeg | bC |
| GL5670 | (1)2 | 6.3 | 23 | cd | bfgHJ |
|  | (2)2 | 6.3 | 23 | fg | BcdhJ |
| 5686 | 3 | 6.3 | 30 | bFgJ | ACDH |
| 5687 | (1)2 | 6.3 | 24 | ab | cDEf |
|  | (2)2 | 6.3 | 24 | gj | bDEf |
| 5690 | (1)3 | 6.3 | 17 | c | Bd |
|  | (2)3 | 6.3 | 17 | e | Gh |
| 5691 | (1)3 | 6.3 | 28 | ab | cG |
|  | (2)3 | 6.3 | 28 | de | fG |
| 5692 | (1)2 | 6.3 | 26 | ab | cG |
|  | (2)2 | 6.3 | 26 | de | fG |
| 5693 | 2 | 6.3 | 27 | cdfh | eG |
| CK5694 | (1)1 | 6.3 | 20 | cd | aG |
|  | (2)1 | 6.3 | 20 | ef | Gh |
| 5696 | 2 | 6.3 | 31 | af | bDEG |
| 5722 | 2 | 5 | 47 | AF | CD |
| 5725 | 3 | 6.3 | 20 | aefg | bD |
| GL5726 | (1)1 | 6.3 | 23 | g | aD |
|  | (2)1 | 6.3 | 23 | b | De |
| GL5727 | 3 | 6.3 | 18 | aEfG | bD |
| 5731 | 2 | 6.3 | 37 | d | Gh |

| Tube | Type | Fil. | Plate | Top | Bottom |
|---|---|---|---|---|---|
| 5749 | 2 | 6.3 | 23 | abef | Dg |
| GL5750 | (1)2 | 6.3 | 22 | a | bD |
|  | (2)2 | 6.3 | 22 | efg | bD |
| 5751 | (1)1 | 6.3 | 22 | ab | cDE |
|  | (2)1 | 6.3 | 28 | fg | DEh |
| CK5755 | (1)1 | 6.3 | 65 | ac | bDE |
|  | (2)1 | 6.3 | 65 | fh | DEg |
| 5763 | 3 | 6.3 | 19 | acfHJ | Eg |
| 5814 | (1)2 | 6.3 | 24 | ab | cDE |
|  | (2)2 | 6.3 | 24 | fg | DEh |
| GL5814 | (1)2 | 6.3 | 25 | ab | cDE |
|  | (2)2 | 6.3 | 25 | fg | DEh |
| 5823 | 4 | .75 | 30 | a | CG |
| 5824 | 3 | 25 | 18 | cde | aGh |
| 5842 | 2 | 6.3 | 20 | aDEGH | fJ |
| GL5844 | (1)1 | 6.3 | 18 | af | Dg |
|  | (2)1 | 6.3 | 18 | be | Dg |
| 5845 | (1)1 | 2.5 | 85 | e | aCD |
|  | (2)1 | 2.5 | 85 | a | CDe |
| 5852 | (1)4 | 6.3 | 19 | c | Gh |
|  | (2)4 | 6.3 | 19 | e | Gh |
| 5879 | 1 | 6.3 | 26 | aghj | cD |
| 5881 | 3 | 6.3 | 20 | cde | Bh |
| 5910 | 1 | 1.4 | 26 | bcf | aE |
| 5915 | (1)1 | 6.3 | 24 | af | bDeg |
|  | (2)1 | 6.3 | 56 | efg | abD |
| 5930 | 3 | 2.5 | 24 | bc | A |
| 5963 | (1)2 | 6.3 | 25 | ab | cDE |
|  | (2)2 | 6.3 | 25 | fg | DEh |
| 5964 | (1)3 | 6.3 | 18 | af | Cg |
|  | (2)3 | 6.3 | 18 | be | Cg |
| 5965 | (1)1 | 6.3 | 18 | fg | hJ |
|  | (2)1 | 6.3 | 18 | ab | cJ |
| GL6005 | 3 | 6.3 | 24 | AefG | bD |
| 6012 | 4 | 6.3 | 18 | ceh | aG |
|  | (No open element test on levers C,E) |  |  |  |  |
| CK6050 | 1 | 1.4 | 67 | ac | B |
| 6072 | (1)1 | 6.3 | 22 | fg | cDEh |
|  | (2)1 | 6.3 | 22 | ab | cDEh |
| 6073(OA2) | 4 | .75 | 40 | AE | BDG |
|  |  | (Good tube reads 10) |  |  |  |
| 6074(OB2) | 4 | .75 | 95 | AE | BDG |
|  |  | (Good tube reads 10) |  |  |  |
| 6080 | (1)3 | 6.3 | 20 | de | fH |
|  | (2)3 | 6.3 | 20 | ab | cH |
| 6082 | (1)3 | 25 | 15 | de | abCfH |
|  | (2)3 | 25 | 15 | ab | cdeFH |
| 6085 | (1)1 | 6.3 | 20 | fg | DEh |
| (E80CC) | (2)1 | 6.3 | 20 | ab | cDE |
| 6086(18042) | 1 | 12.6 | 18 | abfj | cE |
|  | (No open element test on lever J) |  |  |  |  |
| GL6087 | (1)3 | 5 | 39 | f | H |
|  | (2)3 | 5 | 39 | d | H |
| 6095 | 3 | 6.3 | 22 | AefG | bD |
| 6096 | 2 | 6.3 | 22 | aef | BCG |

| Tube | Type | Fil. | Plate | Top | Bottom |
|---|---|---|---|---|---|
| 6097 | (1)1 | 6.3 | 23 | g | aD |
|  | (2)1 | 6.3 | 23 | b | De |
| 6098 | 3 | 6.3 | 20 | ceg | aH |
| 6099/CT | (1)1 | 6.3 | 23 | be | Dg |
|  | (2)1 | 6.3 | 23 | af | Dg |
| 6100 | 2 | 6.3 | 25 | AEf | Dg |
| 6101 | (1)1 | 6.3 | 18 | be | Dg |
|  | (2)1 | 6.3 | 18 | af | Dg |
| GL6134 | 3 | 6.3 | 21 | dfh | ceG |
| 6135 | 2 | 6.3 | 25 | AEf | Dg |
| 6136 | 2 | 6.3 | 22 | abef | Dg |
| GL6137 | 3 | 6.3 | 24 | dfh | ceG |
| 6146 | 3 | 6.3 | 23 | cek | ADFG |
| R6158A | 1 | 1.4 | 98 | k | aCdefGH |
|  | (Good = 26) (For element test use levers G and K only) |  |  |  |  |
| 6197 | 2 | 6.3 | 20 | BCfgHJ | aE |
| 6201 | (1)2 | 6.3 | 24 | fg | hJ |
|  | (2)2 | 6.3 | 24 | ab | cJ |
| 6202 | (1)3 | 6.3 | 25 | f | Dg |
|  | (2)3 | 6.3 | 25 | a | Dg |
| 6211 | (1)1 | 6.3 | 18 | ab | cDE |
|  | (2)1 | 6.3 | 18 | fg | DEh |
| 6216 | 3 | 6.3 | 19 | AbFg | CEH |
| 6227 | 3 | 6.3 | 18 | bghj | cD |
| 6265 | 2 | 6.3 | 22 | aefg | bC |
|  | (No open element test on levers E,G) |  |  |  |  |
| 6267 | 1 | 6.3 | 20 | afhj | cE |
|  | (No open element test on lever F) |  |  |  |  |
| 6350 | (1)1 | 6.3 | 22 | fh | DEg |
|  | (2)1 | 6.3 | 22 | ac | bDE |
| 6360 | (1)3 | 6.3 | 22 | afg | bcDEh |
|  | (2)3 | 6.3 | 22 | cgh | abDEf |
| 6386 | (1)2 | 6.3 | 26 | cd | bJ |
|  | (2)2 | 6.3 | 26 | fg | hJ |
| 6417 | 3 | 12.6 | 17 | acfHJ | Eg |
| 6463 | (1)2 | 6.3 | 21 | fh | DEg |
|  | (2)2 | 6.3 | 21 | ac | bDE |
| 6550 | 3 | 6.3 | 21 | cde | Gh |
| 6679 | (1)2 | 6.3 | 24 | ab | cJ |
|  | (2)2 | 6.3 | 24 | fg | hJ |
| 6680 | (1)2 | 6.3 | 25 | ab | cDE |
|  | (2)2 | 6.3 | 25 | fg | DEh |
| 6681 | (1)1 | 6.3 | 20 | ab | cDE |
|  | (2)1 | 6.3 | 20 | fg | DEh |
| 6829 | (1)3 | 6.3 | 20 | ab | cDE |
|  | (2)3 | 6.3 | 20 | fg | DEh |
| 6883 | 3 | 12.6 | 19 | cek | adfG |
|  |  | (A, D, F show short) |  |  |  |
| 6893 | 3 | 12.6 | 21 | cek | ABDF |
| 7000 | 2 | 6.3 | 29 | cdk | aeGh |
| 7193 | 2 | 6.3 | 24 | k | Gh |
|  |  | (Short Top Caps Together) |  |  |  |
| 7700 | 1 | 6.3 | 20 | bck | deF |
| Z2000 | (1)1 | 6.3 | 22 | be | Cg |
|  | (2)1 | 6.3 | 22 | af | Cg |
| 9001 | 1 | 6.3 | 20 | aef | BDG |
| 9002 | 2 | 6.3 | 27 | AEf | BDG |
| 9003 | 2 | 6.3 | 27 | aef | BDG |
| 9006 | 1 | 6.3 | 25 | AE | BDG |
| AF | (1) 3 | 2.5 | 24 | b | D |
|  | (2) 3 | 2.5 | 24 | c | D |
| AG | (1) 3 | 5 | 26 | b | D |
|  | (2) 3 | 5 | 26 | c | D |
| G4 | (1) 1 | 2.5 | 45 | c | dE |
|  | (2) 1 | 2.5 | 45 | b | dE |
| GA | 3 | 5 | 32 | bcd | E |
| GL5663 | 2 | 6.3 | 32 | aeg | bC |
| PZ | 3 | 2.5 | 41 | bcd | E |
| PZH | 3 | 2.5 | 36 | bcd | eF |
| R30 | 2 | 2 | 35 | bc | D |
| R100 | 3 | 7.5 | 43 | k | D |
|  |  | (short top caps together) |  |  |  |
| RK33 | (1) 3 | 6.3 | 27 | de | fG |
|  | (2) 3 | 6.3 | 27 | ck | bG |
| RK34 | (1) 3 | 6.3 | 27 | ek | dG |
|  | (top cap lead on left top cap) |  |  |  |  |
|  | (2) 3 | 6.3 | 27 | ck | dG |
|  | (top cap lead on right top cap) |  |  |  |  |
| WL-481 | 4 | 2.5 | 59 | k | D |
| WX-12 | 1 | 1.4 | 55 | bc | D |
| WND-A | 3 | 6.3 | 35 | bc | deF |
| WND-C | 3 | 2.5 | 35 | bc | deF |
| XXFM | (1) 1 | 6.3 | 20 | bc | dGH |
|  | (2) 1 | 6.3 | 27 | e | dH |
|  | (3) 1 | 6.3 | 27 | f | gH |

Each roll chart, supplied as a part of the Tube Checker kit models TC-1, TC-2 and TC-2P, contains data for checking all tubes generally encountered in normal service work. The supplementary list was compiled for the purpose of keeping the physical length of the regular chart at a minimum. This arrangement will facilitate the mechanical operation of the roll chart assembly.

# The TC-2 Heathkit Tube Checker



## HEATHKIT TUBE CHECKER FEATURES

Simplified, fast, lever switches allow insertion of individual tube elements making the instrument extremely flexible and truly obsolescence free.

Any combination of base connections possible.

Filament voltages from .75V to 117V available.

Has 1 ma 100 mv meter with easily read "good" "bad" scale.

Blank socket hole provided to facilitate modification for checking newly added types.

Correct settings for new tubes easily determined.

Checks 4, 5, 6 and 7 pin large, regular and miniature, octal, loctal, Hytron, 9 pin miniature series tubes and pilot lamps.

Checks for emission, shorted elements, open elements and filament continuity.

Tests oscillator section of converter tubes separately.

Highest quality switches, meter and sockets.

Fast acting gear driver roll chart.

Fine wood cabinet and attractive two color panel.

# ASSEMBLING THE HEATHKIT MODEL TC-2 TUBE CHECKER

The Heathkit Tube Checker provides the most modern rapid method of checking receiver tubes available. Fast action lever switches control the position of each element allowing its insertion or removal thereby indicating that each tube element is functioning. Open elements are found easily. Shorted elements are indicated by neon glow bulb.

The best of parts are used in your Heathkit Tube Checker--Centralab lever switches and wire wound controls, Amphenol sockets, quality power transformer, Mallory rotary switches, clear plastic faced one MA meter using Alnico V magnet, brass gear driven roller chart.

The line voltage control is continuously variable allowing accurate adjustment. A complete range of filament voltages are provided. The Stackpole spring return test slide switch protects the meter while the checker is being set up, as the instrument should never be in test position except when set for the type of tube under test.

The Heath Company has provided the best of materials and design in this instrument and it deserves the best of construction. This instrument will be useful many years and care taken in assembly will eliminate trouble later.

Thoroughly familiarize yourself with the layout,. schematic, pictorial and photo-prints. Read the instructions completely through once and if helpful mark the values of the parts on the schematic--even if not familiar with radio symbols follow the construction on the schematic identifying the symbols on the information chart--later more complicated sets are shown with schematic only and learning on this tube checker is good training.

Make a good mechanical joint of each connection--metal to metal as solder itself is not a good conductor and serves only to hold the connection rigid. Where a wire makes a connection, take the bare wire through the hole and bring it back to the outside wire making a solid connection that can be pulled without coming loose. Use only good quality ROSIN CORE RADIO TYPE SOLDER. Other types will corrode and ruin delicate radio parts.

Begin by checking the parts against the parts list. Identify each part. This will avoid throwing away any small parts in the packing. Use the charts to identify resistors and condensers.

From time to time, small changes in parts will be made by the Heath Company. All parts supplied will work just as well as the part for which it was substituted. 47,000 ohm resistors (which is the new radio manufacturers rating for 50,000 ohms) may be substituted for 50,000 ohms or a one watt resistor may be substituted for ½ watt, etc. All substitutions will be of equal or better quality than the original and will be made in order that a minimum delay will occur in filling your order.

The newer types of insulated resistors have a higher wattage rating. The ¼ watt size is now rated at ½ watt and these are used in this kit. Bolts and nuts are counted mechanically and if a few are missing, please secure locally.

The sockets are held in place by the wavy metal rings which are forced over the sockets and into the grooves provided around the upper edge of the socket. The end of the ring can be held in the groove and the rest of the ring forced over and into the groove with a screw driver.

Begin the assembly with the sockets. Note that the keyway or indicating pin is toward the opposite or lever switch side of the panel. The miniature sockets are held in place by the cupped washers which have sharp points on the inside and should be installed first. These are forced over the socket tightly against the panel. The power slide switch mounts with the two terminals toward top panel (nearest line cord grommet.) The filament selector switch is mounted as shown and then the wiring to it, as shown in step one, is completed before mounting the transformer directly over it. Connect the resistor TC49 (75,000 ohm) to the last (100-115V) terminal of the selector switch when this lead is attached--use spaghetti over the resistor lead and leave the lead length of the resistor as long as possible to reach the terminal strip which is installed later. Mount the line adjust control TC32 and connect the black leads from the power transformer as showr Use one nut below the panel on this control as the locating pin on the control is not used and its thickness must be accounted for. Connect the black primary transformer lead marked zero (0) to the OFF-ON slide switch (O94).

The following additional parts are now assembled to the panel--the ten lever switches (TC33), the two pole four position rotary switch (TC13), the 200 ohm plate adjust control (TC11), the double pole double throw spring return slide switch with the slide normally in the "adjust line-short" position (TC14), the indicating meter TC25. While mounting the meter install the dual terminal strip under the meter holding nut nearest the power transformer and the three contact vertical terminal strip under the mounting nut nearest the plate control potentiometer. The instrument rectifier (TC10) is mounted against one of the roll chart brackets (TC37) on the side opposite the bracket feet. This bracket is then mounted beside the power transformer with the rectifier toward the selector switch. The other three contact vertical terminal strip is held in place by the roll chart bracket nut nearest the seven prong socket. The line cord, grid clip and neon indicator rubber grommets are installed. The large brass drive gear is held in place by a quarter inch rod which has a 6-32 stud on one end, a slight shoulder prevents the gear from coming off, the other two contact terminal strip mounts under the nut which holds this stud in place. The tubular condenser (O49) is connected between the two terminal strips below the meter. Resistor TC53, O12 and A11 are now mounted on these terminal strips as shown on step two wiring diagram. Resistors TC51, TC52, TC30 and TC31 are mounted on rotary switch TC13. The secondary red leads from the power transformer are connected as shown and resistor TC29 is mounted on the dual terminal strip near the plate control potentiometer. Bus wire is supplied for the connection of the three contacts on the ten lever switches--the contacts nearest the roller chart are the rotor contacts which later connect to the tube contacts. The balance of the wiring in step two can now be completed--(CAUTION: Use the leads as supplied with the instrument rectifier placing spaghetti over them--do not solder to the rectifier itself as heat will ruin it.) Observe the polarity of the rectifier--a small red dot on one contact denotes the positive terminal. The neon short indicator bulb is placed in its socket and pressed into the rubber grommet--use sufficient wire in connecting the socket to allow for its removal for bulb replacement. Install the line cord using a knot inside the grommet to prevent strain on the solder connections. The line cord should be separated into two leads, one going to the center contact of the adjust control, the other to the other contact of the slide switch. With the completion of step two wiring, the tester sockets are wired as shown in wiring step number three. All the connections from the lever switches should be carried around the end of the roll chart bracket to the sockets. In wiring the sockets, all number one pins are connected together, number two pins together, etc.--in case of question about any particular socket, consult any tube manual. The lever switches are connected in the same order, lever switch A to socket pin No. 1, lever switch B to pin No. 2, etc. Lever switch K (I is omitted as it looks like a one and might be confusing on the chart) connects to the grid clip at the dual terminal strip near the meter. The pilot light testing socket located in the center of the seven prong socket is connected directly to the filament contacts on the lever switches eliminating the need for setting any lever switch for checking them.

Upon completion of the wiring, a recheck should be made by tracing over each lead of the step wiring diagrams with a colored pencil as the wire is followed through in the instrument. If all wiring is correct, insert the power plug into 110-120 Volt 60 cycle AC outlet and slide power switch to on position, meter pointer should go to approximately one-half scale. If meter attempts to swing left, the instrument rectifier connections are reversed. In localities having a high line voltage, a minimum setting of the "Line Adjust" control should be used. The quality check will not be affected.

With the instrument operating satisfactorily, the roller chart should be installed, A roll of special adhesive tape is provided to cement the plastic window in place. This tape is adhesive on each side and a six and one half inch strip is placed parallel to each side of the roller chart window under the instrument. The plastic is then pressed against the tape and is firmly held in place by the tape. See that the plastic completely covers the tapes or remove excess tape with knife to prevent chart from sticking to tape. The chart should not be unrolled to avoid the possibility of misalignment. Loosen the screws holding the roll chart bracket which has the gear drive sufficiently to allow the chart pins to be inserted into the bracket. Leave the chart slightly loose so that the chart rolls easily. Tighten the bracket screws and test by rolling the chart to each end using care as the end is approached to prevent tearing the chart from the rollers. If chart tightens at ends, loosen slightly more. The instrument is now installed in the cabinet using the four wood screws supplied.

## USE OF THE HEATHKIT TUBE CHECKER

The following steps should always be followed in setting up for any tube test.

1. With power cord connected, move roll chart to tube to be tested and turn set line control until meter pointer is at line test point.
2. Set type switch to type shown in chart.
3. Set filament selector switch to voltage shown.
4. Set plate control to setting shown in chart.
5. Set lever switches to top and bottom positions as shown in top and bottom column of chart.
6. Insert tube.
7. Check tube for short by moving levers shown in light type through the two positions, returning it to the position shown on chart. Flashing during switching indicates no defect.
8. Check Tube for quality by sliding test slide switch to test position (allowing sufficient time for tube to heat.) Pointer indication above full scale indicates tube is extremely good or more than 130%. To make element continuity check on these tubes, turn plate control so that pointer falls within end scale markings and proceed with continuity tests. Tubes having the same base connections and similar characteristics, and in some instances differing only in filament voltage, occasionally have slightly different roll chart settings to provide optimum conditions for testing.

To test for open elements, proceed as follows:

9. Holding slide switch in test position, move each lever in the T (top) position (only those shown in light type) to the B (bottom) and return. Satisfactory element (one properly connected to its pins) is indicated by a change in meter reading. The grid element usually shows a large change while a screen or plate shows only slight change.

To check filaments and a filament taps for continuity: Set filament selector to .75.

10. Move each lever shown in dark type in right column on the chart through its two positions--satisfactory filament and taps shown by bright glow of short test indicator (always move one lever at a time.)

Please make the following changes in your Tube Chart.

| | | | | | |
|---|---|---|---|---|---|
| 6AK6 | 3 | 6.3 | 30 | ABEF | **C**G |
| 6K8 | 1 | 6.3 | 20 | EF | **G**H |
| | 1 | 6.3 | 22 | CDK | **G**H |
| 12AL5 | 1 | 12.6 | 25 | G | A**D** |
| | 1 | 12.6 | 25 | B | **D**E |
| VR-75 | 4 | .75 | 30 | E | B**CG** |
| VR-90-30 | 4 | .75 | 30 | E | BCG |
| VR-105 | 4 | .75 | 30 | E | B**CG** |
| VR-150-30 | 4 | .75 | 30 | E | BCG |

## MULTIPLE TYPE TUBES

Tubes which contain several sets of elements are indicated on the chart by a bracketed set of listings, one for each test to be made on the tube. The tester is set up according to the tests in each line and checked through all the tests as outlined above.

## NEW TUBES

New type tubes may easily be set up and checked if the data on the tube is available.

1. Determine the filament voltage and set filament selector accordingly.
2. Set type control as follows: Position one for diode types and low cathode current types below 4 ma), position two for tubes with current drains between 3 and 15 ma filament types, position three heater type tubes above 8 ma, position four gas control tubes, gaseous rectifiers and eye or target tubes.
3. Leave the first filament connection lever (lever A is pin No. 1, lever B is pin No. 2, etc.) in the center position.
4. Move the other filament lever to the B (bottom) position (if filament is tapped, move it to B position also.)
5. Move the cathode to B (bottom) position.
6. Move all other elements (screens, suppressors, grid, plate, etc.) to the T (top) position.
7. Hold test slide switch in test position and adjust plate load control to bring pointer to mid point of the good scale (check several tubes and select the average.)
8. Note the settings in this manual.

Special Sockets: The Heath Company will attempt to supply sockets for any type tube on request. An acorn socket can be supplied and the panel punched for it for a charge of $2.00. In testing tubes with more than one top contact, a small grid clip lead can be made with a phone tip on the other end which can be inserted in contact of vacant socket and connected into tester with proper lever switch.

## IN CASE OF DIFFICULTY

1. Recheck entire wiring. Follow each lead on the schematic with colored pencil and trace it out on the instrument. Most cases of difficulty result from wrong or reversed connections (often having a friend check the wiring will divulge an error consistently being overlooked.)
2. Check the voltages as shown on the transformer wrapper at the connections of the transformer leads. This will show up misinterpretation of the markings.
3. Make continuity check between lever switch rotor contacts and various socket pins to make certain that all contact ones are connected to lever A, etc.
4. The set line control normally operates hot and effects a part of its colling through the aluminum panel. Slight vibration of the meter needle is to be expected.
5. If unable to obtain results, write the Service Department of the Heath Company giving all possible information such as indications, voltages, etc. and we will attempt to help you.
6. If desired, your instrument may be returned to the factory for repair or service. The Heath Company will check your tube checker and put it in operating condition for a charge of $3.00 plus charges for any parts or alterations required due to damaged or improper construction.

NOTE: Before returning your instrument to factory, be sure to install all panel and chassis mounting screws.

Tighten power transformer securely.

Attach a tag, giving name, address and trouble experienced, to your instrument.

Pack instrument in a rugged container, preferably wood using at least three inches of shredded newspaper or excelsior on all sides. Do not use folded newspaper. Do not ship in original carton only.

Ship by prepaid express if possible. Return shipment will be made by express collect.

Failure to follow the above instructions may result in damage in transit which might not be considered by the carrier as their responsibility.

Prices subject to change without notice. The Heath Company reserves the right to change the design or construction of its instruments without incurring liability for equipment or products previously supplied.

## WARRANTY

The Heath Company limits its warranty on any part supplied with any Heathkit (except tubes, meters, and rectifiers, where the original manufacturer's guarantee only applies) to the replacement within three (3) months of said part which, when returned with prior permission, postpaid, was, in the judgment of the Heath Company, defective at the time of sale.

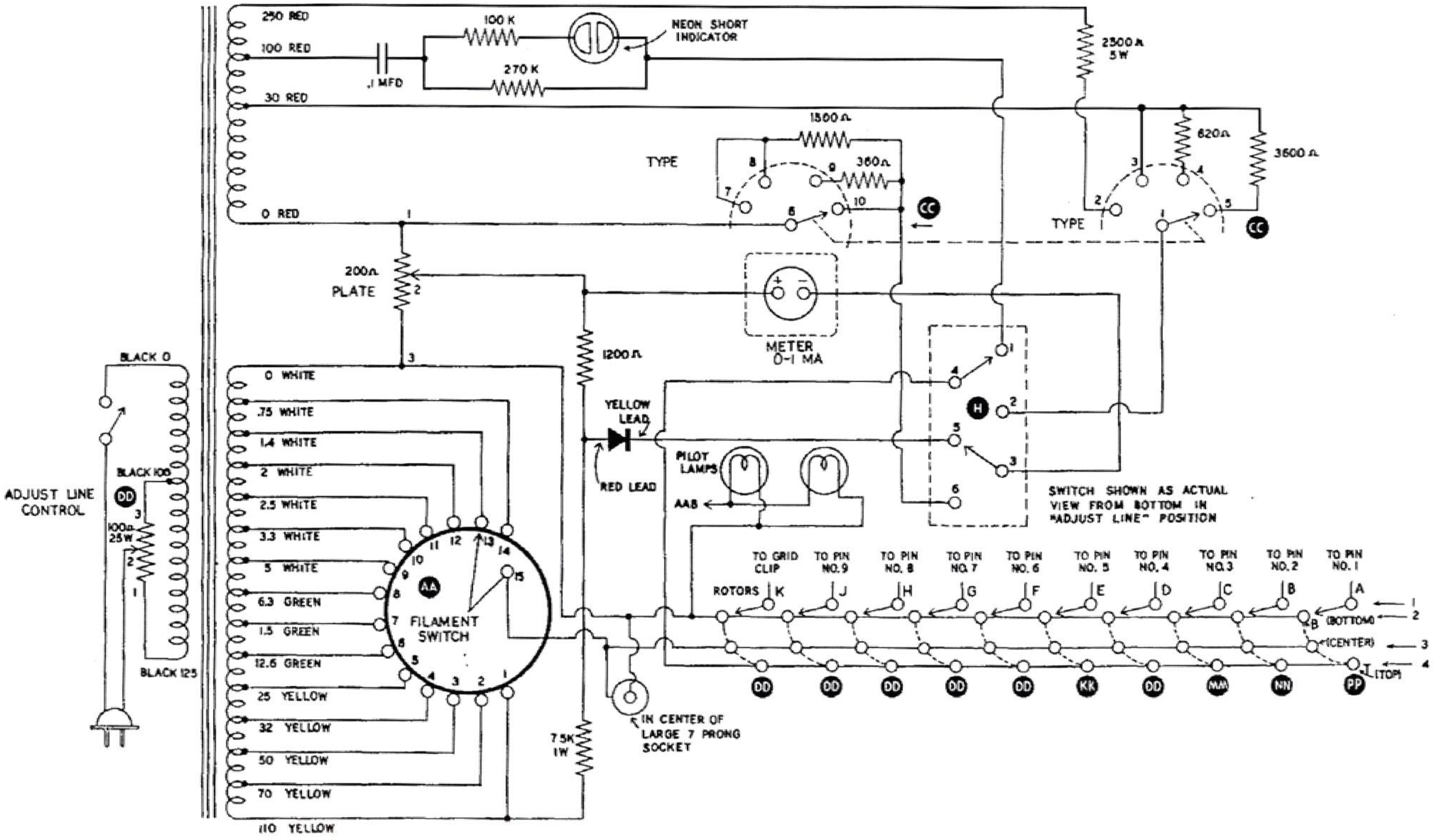
The assembler is urged to follow the instructions exactly as provided. The Heath Company assumes no responsibility for the operation of the completed instrument, for liability for any damages or injuries sustained in the assembly or operation of the device.

HEATH COMPANY
Benton Harbor, Michigan

## TC2 TUBE CHECKER PARTS LIST

| PART NO. | PARTS PER KIT | DESCRIPTION |
|---|---|---|
| RESISTORS | | |
| TC49 | 1 | 75,000 Ohm 1 Watt 2% Prec. Res. |
| TC71 | 1 | 360 Ohm Resistor |
| G10 | 1 | 820 Ohm Resistor |
| O13 | 1 | 1,200 Ohm Resistor |
| FM41 | 1 | 1,500 Ohm Resistor |
| G11 | 1 | 3,600 Ohm Resistor |
| O12 | 1 | 100,000 Ohm Resistor |
| A11 | 1 | 270,000 Ohm Resistor |
| TC29 | 1 | 2500 Ohm 5 Watt w.w. Resistor |
| CONDENSERS | | |
| O49 | 1 | .1 MFD Condenser |
| CONTROLS | | |
| TC11 | 1 | 200 Ohm Control |
| TC32 | 1 | 100 Ohm 25 Watt Control |
| SWITCHES | | |
| O94 | 1 | SPST Slide Switch |
| TC33 | 10 | Single Pole 3 Pos. Lever Sw. |
| TC12 | 1 | Single Pole 14 Pos. Rotary Sw. |
| TC14 | 1 | DPDT Spring Return Slide Sw. |
| TC13 | 1 | 2 Pole 4 Pos. Rotary Sw. |
| KNOBS - SOCKETS - TERMINAL STRIPS | | |
| TC34 | 10 | Knobs for Lever Switches |
| O51 | 2 | Small Pointer Knobs |
| TC24 | 2 | Large Pointer Knobs |
| TC22 | 1 | 4 Prong Socket (78-S4) |
| TC19 | 1 | 5 Prong Socket (78-S5) |
| TC18 | 1 | 6 Prong Socket (78-S6) |
| TC16 | 1 | 7 Prong Socket (78-7CD) |
| TC17 | 1 | Loctal Socket (78-8L) |
| O54 | 1 | Octal Socket |
| O43 | 7 | Octal Socket Rings |
| TC54 | 1 | Large Socket Ring |
| TC15 | 1 | 7 Prong Miniature Socket (78-7P) |

| PART NO. | PARTS PER KIT | DESCRIPTION |
|---|---|---|
| TC55 | 2 | Miniature Socket Rings |
| TC21 | 1 | 9 Prong Miniature Socket (78-A9P) |
| TC20 | 1 | Hytron 5 Prong Socket (78-6H) |
| TC27 | 1 | Blank Socket (78-B) |
| C25A | 1 | Pilot Light Socket |
| SG25 | 2 | 3 Lug Terminal Strips |
| S32 | 2 | 2 Lug Terminal Strips |
| SG22 | 1 | NE51 Bulb |
| MISCELLANEOUS | | |
| TC10 | 1 | Half Wave Instr. Rectifier |
| TC23 | 1 | Grid Clip |
| TC40 | 1 | Drive Gear Pin |
| TC43 | 1 | Large Gear (G-140) |
| TC66 | 1 | 5/16" Grommet |
| O35 | 1 | 3/8" Grommet |
| C24 | 1 | Pilot Light Grommet |
| TS72 | 34 | #6 Lock Washers |
| TC39 | 4 | Brass Washers #10 7/16" OD |
| O28 | 4 | Control Washers |
| O31 | 32 | 6/32 x 3/8" Machine Screws |
| O101 | 4 | Lock Washers |
| S22 | 34 | 6/32 x 1/4"Nuts |
| O33 | 4 | Control Nuts |
| TC46 | 4 | #6-5/8" Type A Sheet Metal Screws |
| TC65 | 1 | Grid Clip Test Lead (1 Ft.) |
| TC35 | 1 | Roll Hook-up Wire (35 Ft.) |
| IB43 | 1 | Length #20 Bare Copperwire (18") |
| P27 | 1 | Length of Spaghetti (6 Inch) |
| O78 | 1 | Line Cord |
| TC69 | 1 | Chart Window |
| TC70 | 1 | Length Window Tape (15") |
| TC64 | 1 | Chart Roller Assembly |
| TC37 | 2 | Roll Chart Brackdts Brackets |
| TC25 | 1 | Tube Checker Meter (O-1 MA) |
| TC26 | 1 | Power Transformer (P131) |
| TC28 | 1 | Panel |
| TC36 | 1 | Cabinet |
| TC1 | 1 | Instruction Manual |


250 RED
100 RED
30 RED
0 RED
.1 MFD
100 K
270 K
NEON SHORT INDICATOR
2500 Ω 5 W
1500 Ω
360 Ω
620 Ω
3600 Ω
TYPE
TYPE
CC
CC
200 Ω PLATE
1200 Ω
METER 0-1 MA
H
YELLOW LEAD
RED LEAD
PILOT LAMPS
AA8
SWITCH SHOWN AS ACTUAL VIEW FROM BOTTOM IN "ADJUST LINE" POSITION
BLACK 0
BLACK 100
BLACK 125
ADJUST LINE CONTROL
DD
100 Ω 25 W
0 WHITE
.75 WHITE
1.4 WHITE
2 WHITE
2.5 WHITE
3.3 WHITE
5 WHITE
6.3 GREEN
1.5 GREEN
12.6 GREEN
25 YELLOW
32 YELLOW
50 YELLOW
70 YELLOW
110 YELLOW
AA
FILAMENT SWITCH
7.5 K 1 W
IN CENTER OF LARGE 7 PRONG SOCKET
ROTORS
TO GRID CLIP
TO PIN NO. 9
TO PIN NO. 8
TO PIN NO. 7
TO PIN NO. 6
TO PIN NO. 5
TO PIN NO. 4
TO PIN NO. 3
TO PIN NO. 2
TO PIN NO. 1
K
J
H
G
F
E
D
C
B
A
(BOTTOM)
(CENTER)
(TOP)
DD
KK
MM
NN
PP

SCHEMATIC
HEATHKIT TUBE CHECKER
Model TC-2

# AMERICAN EQUIVALENTS TO EUROPEAN TUBE TYPES

The following European tube types may be checked on the Heathkit tube testers, using the information listed on the chart or supplement for the American Equivalent.

| European No. | American No. | European No. | American No. | European No. | American No. |
|---|---|---|---|---|---|
| DA90 | 1A3 | EC80 | 6Q4 | EQ80 | 6BE7 |
| DAC32 | 1H5 | EC81 | 6R4 | EY80 | 6V3 |
| DAF91 | 1S5 | EC84 | 6AJ4 | EY81 | 6R3 |
| DAF92 | 1U5 | EC90 | 6C4 | EY88 | 6AL3 |
| DAF96 | 1AH5 | EC92 | 6AB4 | EZ35 | 6X5 |
| DC80 | 1E3 | EC94 | 6AF4 | EZ80 | 6V4 |
| DCC90 | 3A5 | EC95 | 6ER5 | EZ81 | 6CA4 |
| DF33 | 1N5 | EC97 | 6FY5 | EZ90 | 6X4 |
| DF91 | 1T4 | EC900 | 6HA5 | GZ30 | 5Z4 |
| DF92 | 1L4 | ECC81 | 12AT7 | GZ32 | 5V4 |
| DF96 | 1AJ4 | ECC82 | 12AU7 | GZ34 | 5AR4 |
| DF904 | 1U4 | ECC83 | 12AX7 | HAA91 | 12AL5 |
| DH63 | 6Q7 | ECC85 | 6AQ8 | HABC80 | 19T8 |
| DH74 | 12Q7 | ECC86 | 6GM8 | HBC90 | 12AT6 |
| DH76 | 12Q7 | ECC88 | 6DJ8 | HBC91 | 12AV6 |
| DH77 | 6AT6 | ECC91 | 6J6 | HF93 | 12BA6 |
| DH81 | 7B6 | ECC180 | 6BQ7 | HF94 | 12AU6 |
| DH149 | 7C6 | ECC189 | 6ES8 | HK90 | 12BE6 |
| DH719 | 6AK8 | ECC230 | 6080 | HL92 | 50C5 |
| DK32 | 1A7 | ECF80 | 6BL8 | HL94 | 30A5 |
| DK91 | 1R5 | ECF82 | 6U8 | HY90 | 35W4 |
| DK96 | 1AB6 | ECF86 | 6HG8 | KT32 | 25W6 |
| DL29 | 3D6 | ECF801 | 6GJ7 | KT63 | 6F6 |
| DL33 | 3Q5 | ECH81 | 6AJ8 | KT66 | 7581 |
| DL35 | 1C5 | ECL80 | 6AB8 | KT71 | 50L6 |
| DL36 | 1Q5 | ECL82 | 6BM8 | KT77 | 6CA7 |
| DL92 | 3S4 | ECL84 | 6DX8 | KT88 | 6550 |
| DL93 | 3A4 | ECL85 | 6GV8 | KTW61 | 6S7 |
| DL94 | 3V4 | ECL86 | 6GW8 | PC95 | 4GK5 |
| DL95 | 3Q4 | EF80 | 6BX6 | PCC85 | 9AQ8 |
| DL96 | 3C4 | EF82 | 6CH6 | PCF80 | 9A8 |
| DL98 | 3B4 | EF85 | 6BY7 | PCF82 | 9U8 |
| DP61 | 6AK5 | EF86 | 6CF8 6267 | PL81 | 21A6 |
| DY30 | 1B3 | EF89 | 6DA6 | PL82 | 16A5 |
| DY80 | 1X2 | EF93 | 6BA6 | PL83 | 15A6 |
| DY86 | 1S2 | EF94 | 6AU6 | PY80 | 19X3 |
| DY87 | 1S2 | EF95 | 6AK5 | PY81 | 17Z3 |
| E80CC | 6085 | EF96 | 6AG5 | PY83 | 17Z3 |
| E80F | 6084 | EF183 | 6EH7 | UAA91 | 12AL5 |
| E80L | 6227 | EF184 | 6EJ7 | UCL82 | 50BM8 |
| E88CC | 6922 | EF190 | 6CB6 | XC95 | 2ER5 |
| E90CC | 5920 | EH90 | 6CS6 | XCC82 | 7AU7 |
| E90F | 6BH6 | EK90 | 6BE6 | XCF80 | 4BL8 |
| E99F | 6BJ6 | EL34 | 6CA7 | XL84 | 8BQ5 |
| E180F | 6688 | EL37 | 6L6 | XF183 | 3EH7 |
| E182CC | 7119 | EL81 | 6CJ6 | XF184 | 3EJ7 |
| EAA91 | 6AL5 | EL84 | 6BQ5 | XXC189 | 4ES8 |
| EABC80 | 6AK8 | EL86 | 6CW5 | YC95 | 3ER5 |
| EB91 | 6AL5 | EL90 | 6AQ5 | YF183 | 4EH7 |
| EBC81 | 6BD7 | EL91 | 6AM5 | YF184 | 4EJ7 |
| EBC90 | 6AT6 | EL95 | 6DL5 | Z729 | 6CF8, 6267 |
| EBC91 | 6AV6 | EL180 | 12BY7 | 85A2 | 0G3 |
| EBF80 | 6N8 | EM80 | 6BR5 | 108C1 | 0B2 |
| EBF89 | 6DC8 | EM81 | 6DA5 | 150C2 | 0A2 |
|  |  | EM84 | 6FG6 | 150C3 | 0D3 |

# HELPFUL KIT BUILDING INFORMATION

Before attempting actual kit construction read the construction manual through thoroughly to familiarize yourself with the general procedure. Note the relative location of pictorials and pictorial inserts in respect to the progress of the assembly procedure outlined.

This information is offered primarily for the convenience of novice kit builders and will be of definite assistance to those lacking thorough knowledge of good construction practices. Even the advanced electronics enthusiast may benefit by a brief review of this material before proceeding with kit construction. In the majority of cases, failure to observe basic instruction fundamentals is responsible for inability to obtain desired level of performance.

## RECOMMENDED TOOLS

The successful construction of Heathkits does not require the use of specialized equipment and only basic tools are required. A good quality electric soldering iron is essential. The preferred size would be a 100 watt iron with a small tip. The use of long nose pliers and diagonal or side cutting pliers is recommended. A small screw driver will prove adequate and several additional assorted screw drivers will be helpful. Be sure to obtain a good supply of rosin core type radio solder. Never use separate fluxes, paste or acid solder in electronic work.

## ASSEMBLY

In the actual mechanical assembly of components to the chassis and panel, it is important that the procedure shown in the manual be carefully followed. Make sure that tube sockets are properly mounted in respect to keyway or pin numbering location. The same applies to transformer mountings so that the correct transformer color coded wires will be available at the proper chassis opening.

Make it a standard practice to use lock washers under all 6-32 and 8-32 nuts. The only exception being in the use of solder lugs—the necessary locking feature is already incorporated in the design of the solder lugs. A control lock washer should always be used between the control and the chassis to prevent undesirable rotation in the panel. To improve instrument appearance and to prevent possible panel marring use a control flat nickel washer under each control nut.

When installing binding posts that require the use of fiber insulating washers, it is good practice to slip the shoulder washer over the binding post mounting stud before installing the mounting stud in the panel hole provided. Next, install a flat fiber washer and a solder lug under the mounting nut. Be sure that the shoulder washer is properly centered in the panel to prevent possible shorting of the binding post.

## WIRING

When following wiring procedure make the leads as short and direct as possible. In filament wiring requiring the use of a twisted pair of wires allow sufficient slack in the wiring that will permit the twisted pair to be pushed against the chassis as closely as possible thereby affording relative isolation from adjacent parts and wiring.

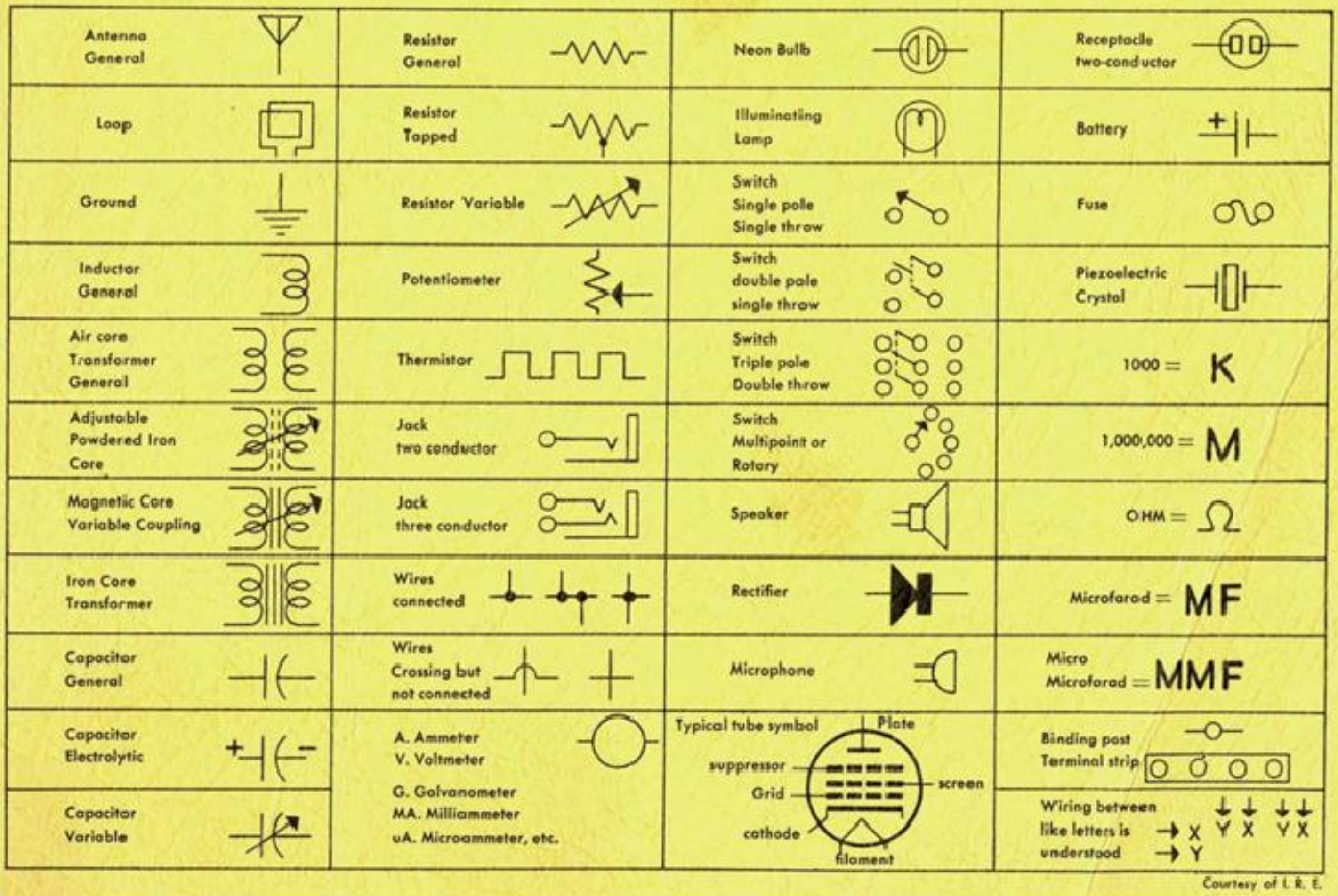
When removing insulation from the end of hookup wire, it is seldom necessary to expose more than a quarter inch of the wire. Excessive insulation removal may cause a short circuit condition in respect to nearby wiring or terminals. In some instances, transformer leads of solid copper will have a brown baked enamel coating. After the transformer leads have been trimmed to a suitable length, it is necessary to scrape the enamel coating in order to expose the bright copper wire before making a terminal or soldered connection.

In mounting parts such as resistors or condensers, trim off all excess lead lengths so that the parts may be installed in a direct point-to-point manner. When necessary use spaghetti or insulated sleeving over exposed wires that might short to nearby wiring.

It is urgently recommended that the wiring dress and parts layout as shown in the construction manual be faithfully followed. In every instance, the desirability of this arrangement was carefully determined through the construction of a series of laboratory models.

## SOLDERING

Much of the performance of the kit instrument, particularly in respect to accuracy and stability, depends upon the degree of workmanship used in making soldered connections. Proper soldered connections are not at all difficult to make but it would be advisable to observe a few precautions. First of all before a connection is to be soldered, the connection itself should be clean and mechanically strong. Do not depend on solder alone to hold a connection together. The tip of the soldering iron should be bright, clean and free of excess solder. Use enough heat to thoroughly flow the solder smoothly into the joint. Avoid excessive use of solder and do not allow a flux flooding condition to occur which could conceivably cause a leakage path between adjacent terminals on switch assemblies and tube sockets. This is particularly important in instruments such as the VTVM, oscilloscope and generator kits. Excessive heat will also burn or damage the insulating material used in the manufacture of switch assemblies. Be sure to use only good quality rosin core radio type solder.



Antenna General
Loop
Ground
Inductor General
Air core Transformer General
Adjustable Powdered Iron Core
Magnetic Core Variable Coupling
Iron Core Transformer
Capacitor General
Capacitor Electrolytic
+
Capacitor Variable
Resistor General
Resistor Tapped
Resistor Variable
Potentiometer
Thermistor
Jack two conductor
Jack three conductor
Wires connected
Wires Crossing but not connected
A. Ammeter
V. Voltmeter
G. Galvanometer
MA. Milliammeter
uA. Microammeter, etc.
Neon Bulb
Illuminating Lamp
Switch Single pole Single throw
Switch double pole single throw
Switch Triple pole Double throw
Switch Multipoint or Rotary
Speaker
Rectifier
Microphone
Typical tube symbol
Plate
suppressor
screen
Grid
cathode
filament
Receptacle two-conductor
Battery
+
Fuse
Piezoelectric Crystal
1000 = K
1,000,000 = M
OHM = Ω
Microfarad = MF
Micro Microfarad = MMF
Binding post
Terminal strip
Wiring between like letters is understood
X
Y

Courtesy of I. R. E.

# HEATH COMPANY

*A Subsidiary of Daystrom Inc.*

THE WORLD'S FINEST ELECTRONIC EQUIPMENT IN KIT FORM

**BENTON HARBOR, MICHIGAN**

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